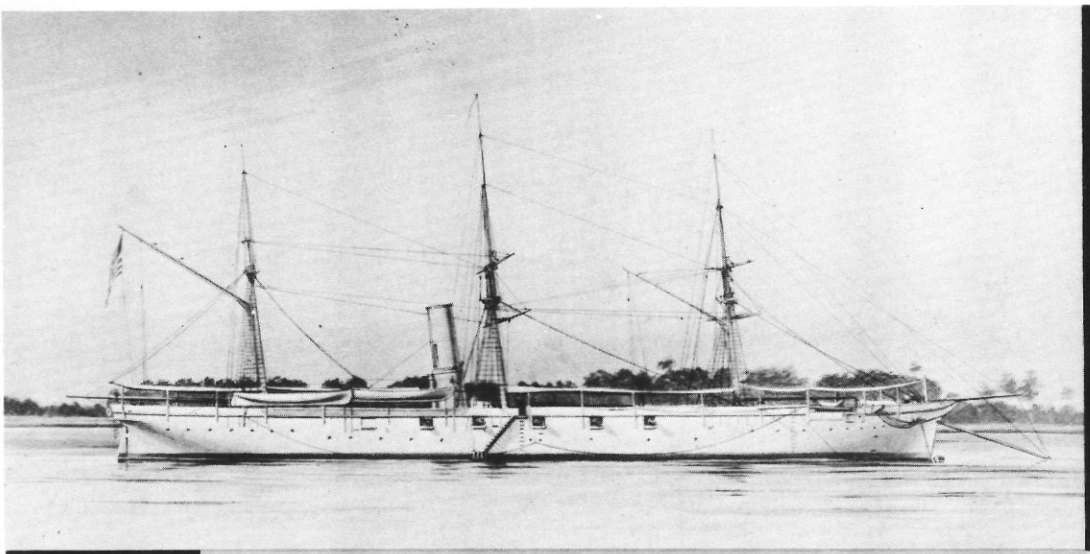
U. S. NAVY Medicine



ISSUE

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POLICY

U.S. Navy Medicine is basically an official Medical Department publication inviting the attention of officers of the Medical Department of the Regular Navy and Naval Reserve to timely up-to-date items of official and professional interest relative to medicine, dentistry and allied sciences. The items used are neither intended to be, nor are they, susceptible to use by any officer as a substitute for any item or article, in its original form. The opinions and conclusions expressed in the articles or items included herein are those of the respective authors and do not necessarily represent the views of the Department of the Navy, the Bureau of Medicine and Surgery or any other governmental department or agency thereof.

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The issuance of this publication approved in accordance with NAVEXOS P-35.

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CONTENTS

Credits: All pictures are Official U.S. Navy Photographs unless otherwise indicated.

Front Cover pictures USS Pawnee (upper), converted to sails and recommissioned as a hospital and storeship 17 December 1870. (See "A 1971 View of the Medical Corps Circa 1871" on page 49.) Beneath PAWNEE, is the USS Sanctuary (AH-17) as she appears on station in the South China Sea. Look for much more about SANCTUARY in our April issue.

Page 4. VADM George M. Davis, MC, USN, Surgeon General, is pictured during a previous visit to the USS Holland (AS-32) — Commanding Officer CAPT R.D. Rawlins, USN. (Photo by FN P.J. Roberts, USN.)

Back Cover photograph reveals a typical staging area at Iwo Jima in March 1945. Mt. Suribachi is seen in the background. Note transport planes on the airstrip waiting to evacuate wounded Marines to U.S. Naval Hospital on Guam, M.I.

We are indebted to Mrs. J.L. Bottazzi, Code 4542, BUMED, for able support in graphic arts throughout this issue.

THE SECRETARY OF THE NAVY

WASHINGTON

TO THE OFFICERS OF THE MEDICAL CORPS

In the 196 years since the first naval surgeon went to sea, Navy doctors have served their country with skill and distinction.

Even before the Medical Corps was formally established on 3 March 1871, the tradition of devotion to duty that is the hallmark of your Corps today was firmly established by the outstanding performance of those early Navy physicians. Today, this tradition rests safely in your capable hands, and I have every confidence that each of you will continue this record of exemplary service in a decade that has already brought new challenges and new responsibilities to every member of the Naval Establishment.

My very best wishes for a most happy Centennial Anniversary celebration.

JOHN H. CHAFEE

CHIEF OF NAVAL OPERATIONS

TO THE OFFICERS OF THE NAVY MEDICAL CORPS

On the occasion of the centennial of the establishment of your Corps, I am pleased to extend particularly warm and meaningful greetings to each of you.

Throughout the years since 1775, when medical officers first served with the fleet, the tradition of selfless professional service to the men of the Navy and Marine Corps and their families has been a proud page in the Navy's history.

The contributions of Navy medical officers have spanned every field and specialty of medical practice, and have brought many new procedures and discoveries into use for the overall benefit of mankind. In peace and war, in combat, naval hospitals and laboratories throughout the world, you and your people have upheld the highest standards and the finest traditions of both military service and the medical profession.

I am confident that you will continue your efforts in a manner which will give even greater service to our people, and increased recognition to the outstanding professional work of your corps.

E. R. ZUMWALT, JR.
Admiral, U.S. Navy

TO THE OFFICERS OF THE MEDICAL CORPS

From 1775 to 1971, wherever the Marines have served -- at home or abroad -- on land or sea -- in peace or war -- you have served with them, and your heroic devotion to duty has earned their eternal respect and admiration.

As you celebrate the 100th anniversary of the formal founding of the Medical Corps, it is a pleasure for me, on behalf of every Marine, to extend my greetings and best wishes to each of you.

We are grateful for your very excellent support. Happy Birthday from the United States Marines!

L. F. CHAPMAN, JR.
General, U. S. Marine Corps
Commandant of the Marine Corps

from the Chief

Between PAWNEE and SANCTUARY, a century has intervened. We are privileged to accompany our Medical Corps as she concludes officially her first one hundred years. We share the awesome responsibility of directing her first steps into the succeeding century. May each of us prove equal to the task.

Our temporal position affords a unique vantage point from which the past and present of the Navy Medical Corps can be viewed, and the promise of the future envisioned. The inimitable contributions of our predecessors reflect the spirit and inspiration which has guided our Corps. These were strong men endowed with indefatigable zeal for somehow improving the condition of people or situations, wherever they found them. They did not seek refuge in weakness, or crumble in adversity. They were not stifled by turmoil or indecision. By their deeds we have known them. By their example we aspire to further the provision of medical service of unsurpassed excellence.

In celebrating her 100th birthday, we extend to our Navy Medical Corps heartfelt wishes for many happy returns — of long life in dedication, of pride in accomplishment and of strength in purpose.

DEPARTMENT OF THE NAVY
ASSISTANT CHIEF OF THE BUREAU OF MEDICINE AND SURGERY (DENTISTRY)
AND
CHIEF OF THE DENTAL DIVISION
WASHINGTON, D. C. 20390

TO THE OFFICERS OF THE MEDICAL CORPS

On the Centennial Anniversary of the Medical Corps, it is a distinct pleasure to extend to each of you heartiest congratulations from the members of the Dental Corps.

It is especially fitting to acknowledge with gratitude the outstanding health care that members of the Medical Corps, past and present, provide to the men and women of the Navy and Marine Corps. It is in the spirit of the great traditions of professional excellence that you continue to enrich the heritage of your distinguished Corps.

As you enter a new century, I am confident that you will proceed with foresight comparable to that of the early founders and with dedication for high professional competence, leadership, devotion to duty and courage to match the unprecedented challenges in this rapidly changing world.

As an integral part of the Medical Department, we in the Dental Corps salute you. We are proud to be associated with you in providing total health care.

Happy Birthday!

E. C. RAFFETTO
Rear Admiral, DC, USN

DEPARTMENT OF THE NAVY
CHIEF OF THE MEDICAL SERVICE CORPS
BUREAU OF MEDICINE AND SURGERY
WASHINGTON, D. C. 20390

TO THE OFFICERS OF THE MEDICAL CORPS

I take great pleasure, on behalf of all Medical Service Corps officers, in extending hearty and sincere congratulations to all of you on the occasion of the Medical Corps Centennial.

Throughout its history, the Medical Corps has established an example of persistent purpose and outstanding accomplishments with great dedication to its profession. Thus, you have earned a truly outstanding reputation, not only within the military services, but throughout the civilian health care field.

I know I speak for all officers of our Corps in pledging our continued support in assisting you in the performance of your mission and in extending you all best wishes for the future.

Happy 100th Birthday!

E. L. VAN LANDINGHAM, Jr.
Captain, MSC, USN

DEPARTMENT OF THE NAVY
BUREAU OF MEDICINE AND SURGERY
WASHINGTON, D.C. 20390

TO THE OFFICERS OF THE MEDICAL CORPS

It is a pleasure to recognize the One Hundreth Anniversary of the establishment of the Navy Medical Corps and to send hearty greetings on this historic occasion.

Your record of valiant and dedicated service, and the contributions made to the health and welfare of the military man and his family are known throughout the world. Navy medicine always has been ahead of its time in pioneering new methods for the care and treatment of the sick and wounded. Your accomplishments can be looked upon with great pride and personal satisfaction.

I know that all Nurse Corps officers join me in extending to the officers of the Medical Corps congratulations and best wishes for continued success.

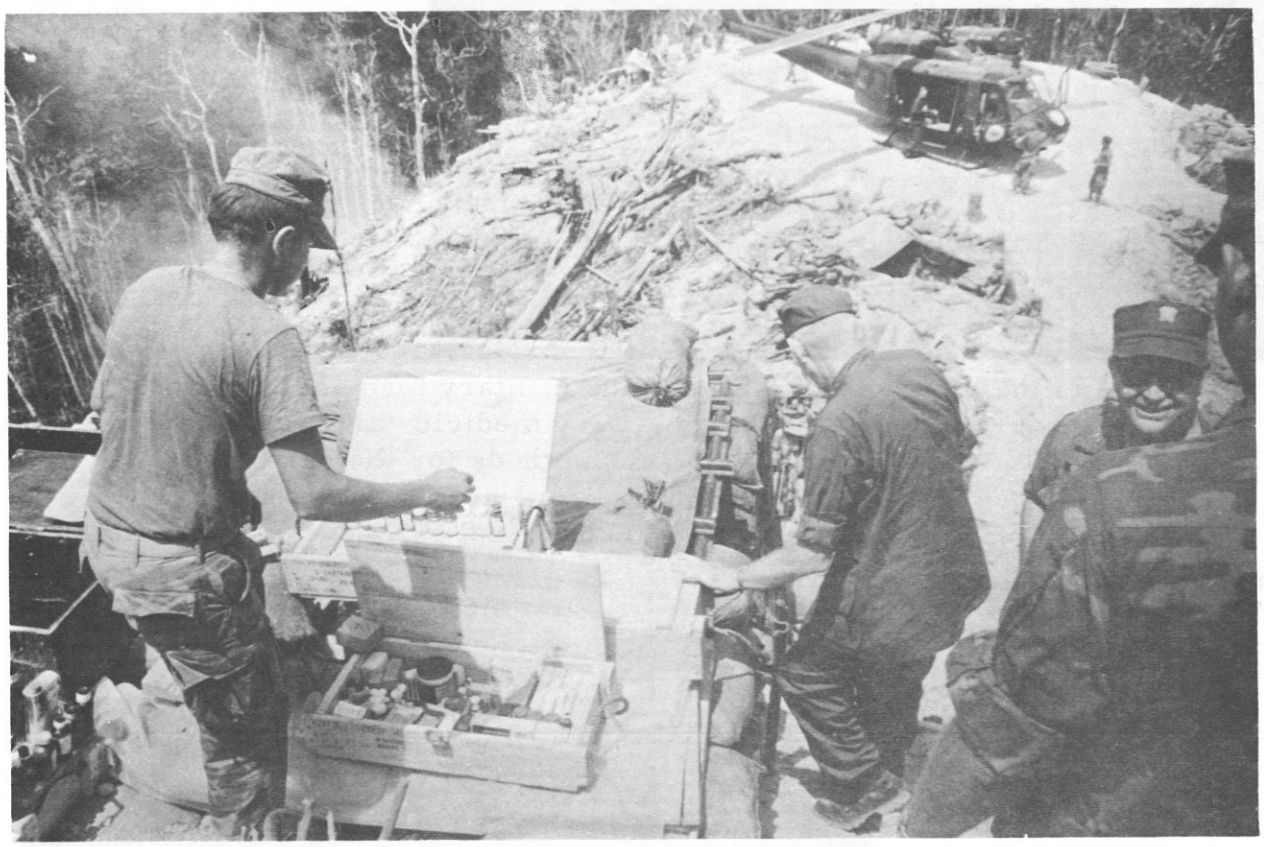
ALENE B. DUERK
Captain, NC, USN
Director, Navy Nurse Corps

The following paper was presented by the author at the Sixth Conference of the Surgeons General of the Navies of the Americas which was held in Washington, D.C., 23-28 Nov. 1970. It is reproduced here through the courtesy of the author, and was intentionally scheduled for the March issue. An overall view of contemporary naval medical support operations, CAPT STOVER's article has condensed the salient features of this subject in an informative and authoritative manner. He is uniquely suited to the project, having had considerable professional experience in this area. We think you will agree that the article provides one of the most articulate and significant reviews of Navy medical support developments which can be found. As the Navy Medical Corps celebrates its centennial year, it is particularly appropriate to consider the present state of "our art", and how it has evolved.

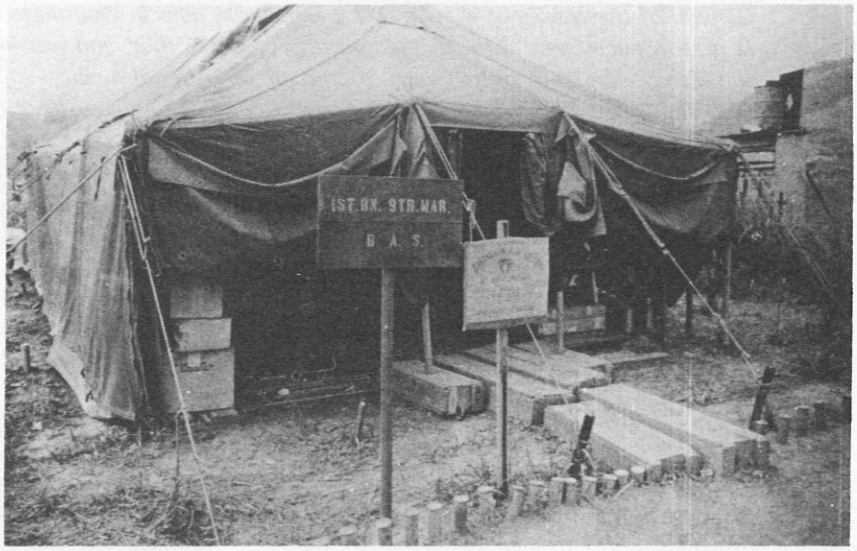
MEDICAL SUPPORT TO THE OPERATING FORCES

By CAPT J. H. Stover, Jr., MC, USN, Director, Fleet and Marine Corps Medical Support Division, BUMED.

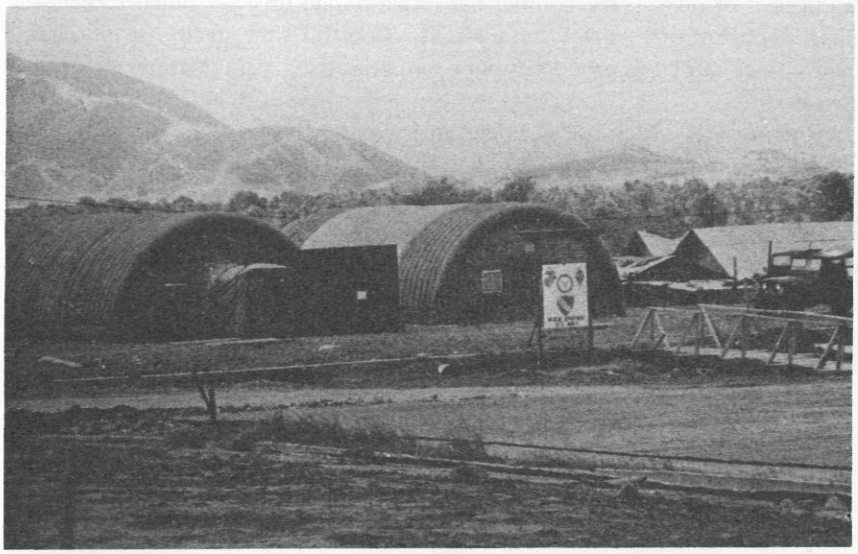
Medical support to the operating forces of the Navy includes both the support to men at sea and to Marines ashore. For the past several years, support of our forces in Vietnam has given us an excellent opportunity to evaluate our total naval medical system. Since our forces afloat have suffered relatively few casualties, most of our emphasis has been placed on the medical system for the support of the Marines fighting ashore. They have experienced no large, dramatic battles like Tarawa, Iwo Jimo, or Okinawa in the present war, but the conflict has lasted a long time — much longer than World War II. And this slow steady fighting has produced more casualties among the Marines than World War II. Our latest figures show 88,000 Marines wounded in Vietnam. In the three years of World War II — from Guadalcanal through Okinawa



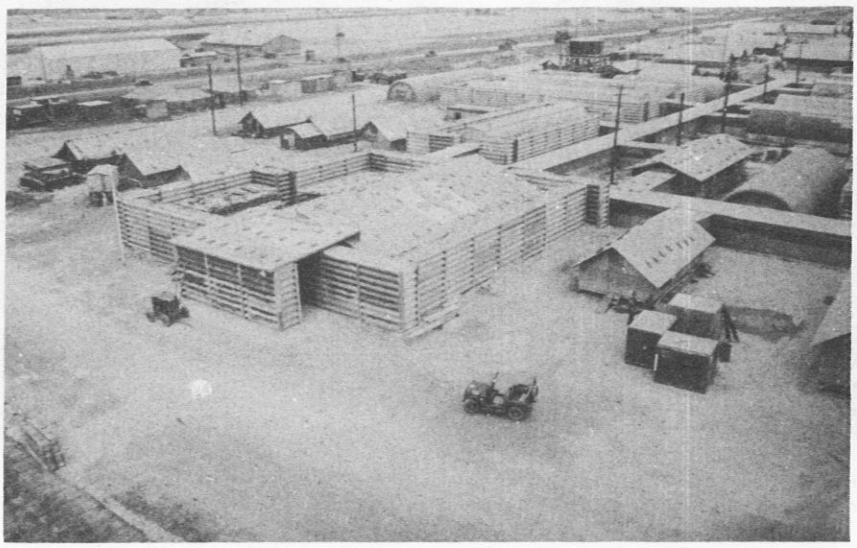
Hospital Corpsman (left) mans an Aid Station at Fire Support Base near DMZ. Artillery battery is above and behind the corpsman. Note small landing space for helicopter on hilltop, and old ammunition boxes used to hold drugs and medicaments.



Typical Battalion Aid Station near Vandegrift Combat Base.



First Hospital Company, inflatable (MUST) units.



Receiving and Surgical areas of 3rd Medical Battalion, Quang Tri, RVN

Aerial view of 1st Division Hospital, DaNang, RVN. In foreground is the 1st Medical Battalion. The 1st Hospital Company is seen in the upper portion of photo.

— 55,000 Marines were wounded. In fact the number of Marines wounded in Vietnam is now larger than the total U.S. Navy and Marine wounded in World War II.

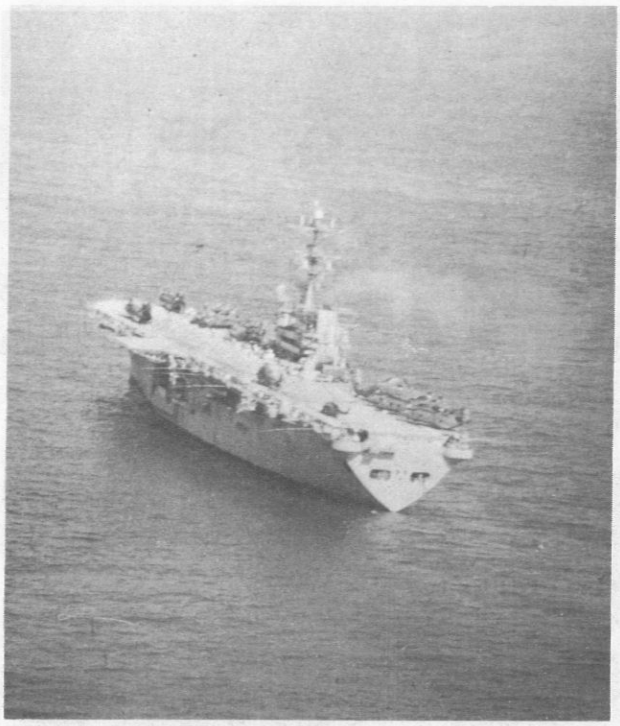
Because almost all of the Marines have been concentrated in a small area, a few northern provinces of Vietnam, we have not needed the many Navy advanced bases and hospital ships that we needed in World War II. Then we were fighting in many widely separated areas, and air evacuation was slow and not as available as it has been in Vietnam. In the Pacific Ocean area in World War II, we had to build 36 Navy hospitals of various sizes and we employed 12 Navy hospital ships. For Vietnam, we built only one advanced base hospital (at DaNang), expanded one hospital (Guam) and have used only two hospital ships.

How do we provide support for Marines in the field?

(1) First of all, we have Navy doctors, dentists, male nurses and corpsmen actually attached to the Marines. They wear Marine uniforms. About 5% of the strength of a Marine Combat Unit is composed of Navy Medical Department personnel. At the front lines we have one Navy corpsman with each squad — one corpsman for every 15 Marine riflemen. In addition to these men in the very front lines, each battalion of Marines has two doctors and 21 more corpsmen who set up the classical Battalion Aid Station.

(2) In addition to these doctors and corpsmen at the front lines, we have hospital units as part of each major Marine organization. The basic unit is called a "Collecting And Clearing Company" and can operate a 60-bed mobile surgical hospital. The four collecting and clearing companies in a Marine Division can be combined to form a 240-bed hospital. When this is done, certain additional specialists such as a neurosurgeon, ocular surgeon, internists and psychiatrists are made available from the Headquarters Unit of the Medical Battalion to provide a more balanced hospital staff.

(3) There are additional hospital units of 100 and 400-bed size, belonging to higher Marine Headquarters, which can be deployed in the field to give more support. The 400-bed Marine hospitals have not been used since World War II, but we did send a 100-bed unit to Vietnam. A Marine Division, of about 27,000 men, thus might have as many as 340 beds or about one for every 80 men. However, many more hospital beds are required to meet casualty loads of even moderate intensity combat. How are they provided?

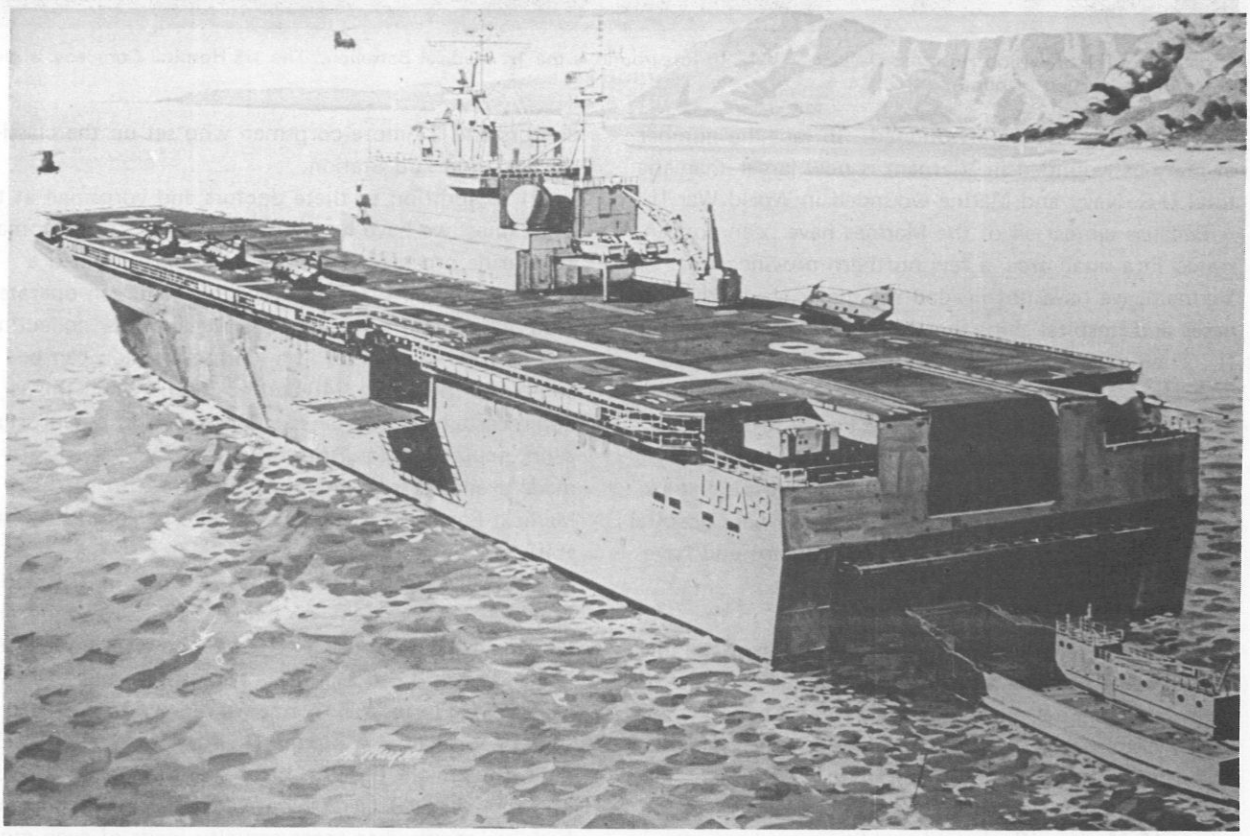


USS Tripoli LPH-10. A helicopter carrier with embarked Marine Special Landing Force.

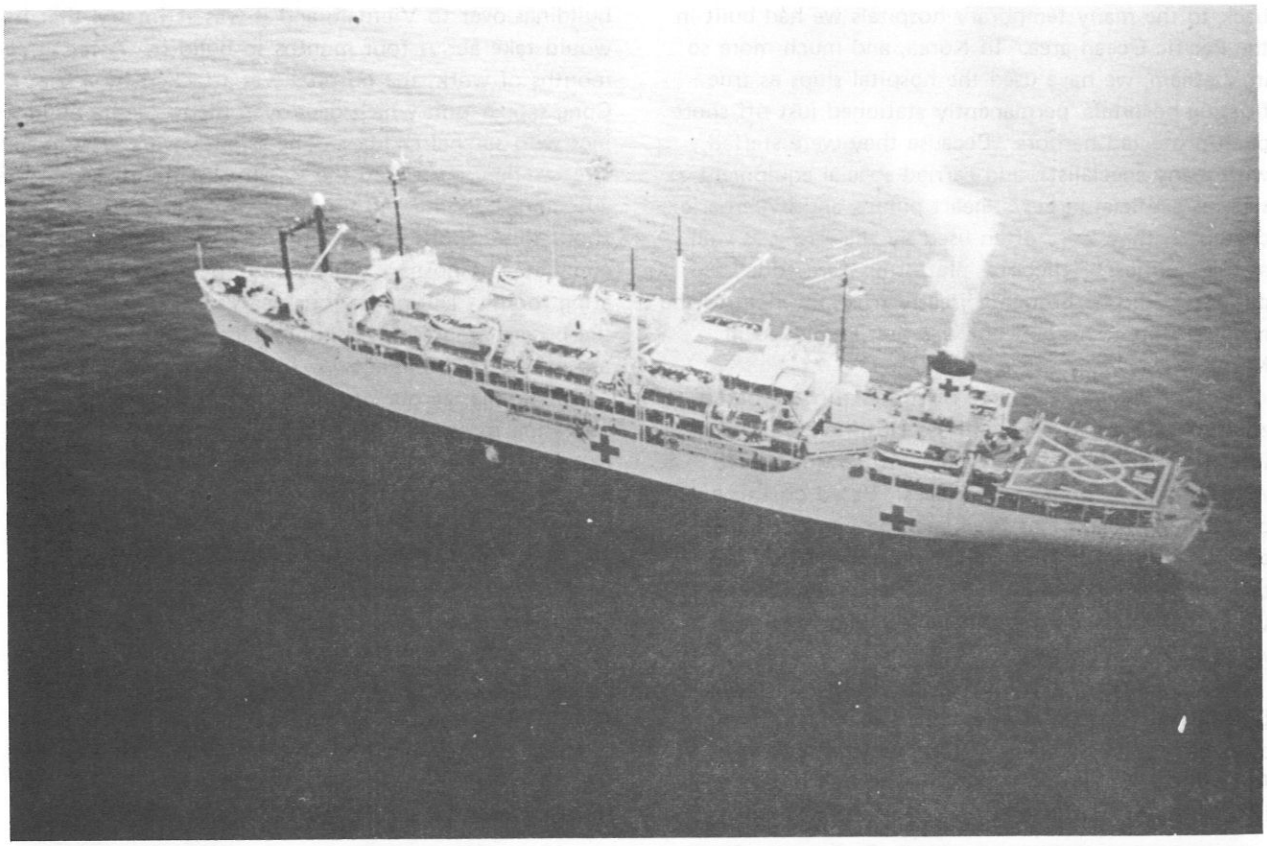
They come from several sources.

(4) First, there are the ships from which the Marines land. In World War II Marines were carried in troop transports and landed in assault boats. We had extra doctors on many of these ships and wounded men were brought back from the beach to the ships for surgery. At Iwo Jima, for instance, we had surgical groups on over 30 such ships. Sometimes the sick bays were made even more elaborate and larger medical staffs were put aboard so that the transport was actually an auxillary hospital ship. In the modern Navy, troop transports have virtually disappeared and Marines are carried to battle on specialized ships, such as helicopter carriers (LPH's). We have started building the first of a new series of ships which will carry Marines, helicopters, boats, and other amphibious vehicles. On these specialized amphibious assault ships (LHA's), we will have very large medical departments. They will have four major, two minor and one dental operating rooms.

In order to man shipboard surgical facilities, we have organized special surgical teams at many of our major Navy hospitals. They have been furnished standardized blocks of prepackaged equipment and supplies, all of which is transportable by air. The



Artist's conception of new generation amphibious assault ship (LHA's) now under construction. These will carry the most extensive medical facilities ever placed aboard a combatant ship.



USS Repose as she was seen from an approaching Medevac chopper.

surgical teams and their equipment can be sent on very short notice to man the surgical spaces on ships if a threatening situation should develop. We have an equal number of specialized nursing teams (medical/surgical support teams) available to man the intensive care and postoperative wards on such ships.

During the Vietnam conflict we have had two Amphibious Ready Groups cruising off the coast which have made 65 assault landings. The medical support has been largely provided by surgical teams such as those just described, working aboard the LPH's.

Another source of shipboard surgical assistance is available, for the first several days of an amphibious operation, from Marine Hospital Unit doctors who have not yet gone ashore. In most of our World War II battles the Marine Hospital Units did not land until D + 4 or 5. The surgical staffs of these units are therefore available to man the operating rooms aboard ship during the first few crucial days when casualties are usually highest.

(5) Another major source of medical and surgical support is the hospital ship. In most of World War II our hospital ships were employed as ambulance ships — they moved wounded men from the combat area

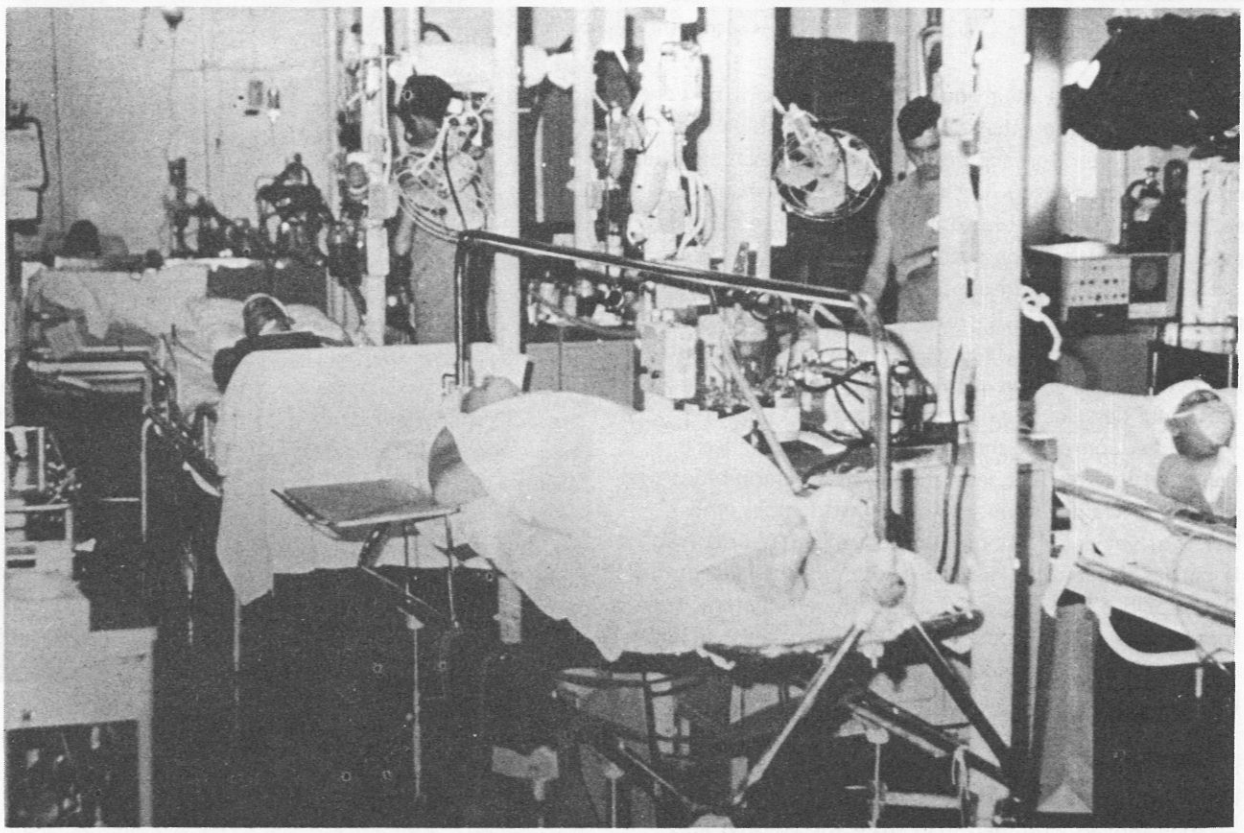
Army "DUSTOFF" helo arrives on HOSPITAL SHIP.

back to the many temporary hospitals we had built in the Pacific Ocean area. In Korea, and much more so in Vietnam, we have used the hospital ships as true floating hospitals, permanently stationed just off shore or in protected harbors. Because they were staffed with many specialists, and carried special equipment such as artificial kidneys, heart pumps and hyperbaric chambers, they were often used by the Army as well as the Marines. Helicopter platforms were added so patients could be brought directly from the field to the hospital ship. This concept was first employed in Korea.

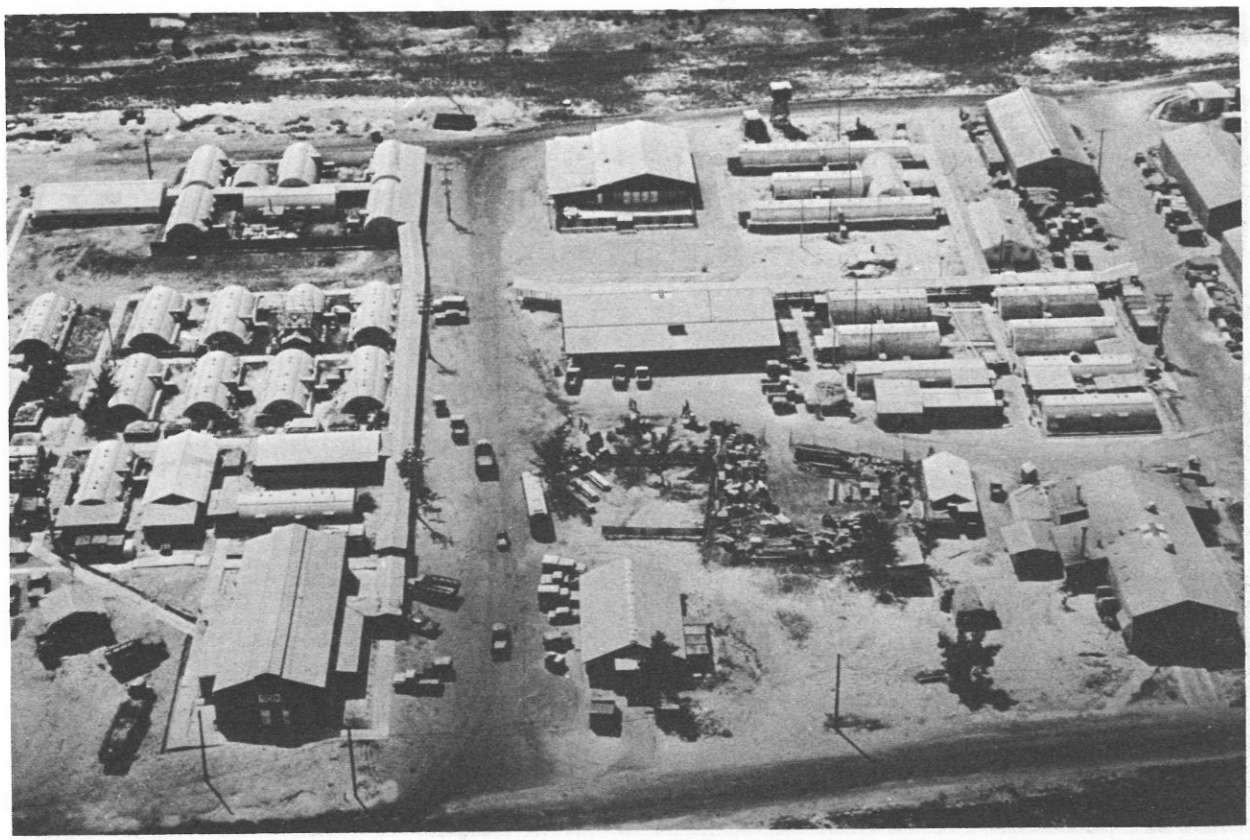
(6) Our last major source of support in the battle zone is the Navy Advanced Base Hospital. In World War II we learned a great deal about setting up advanced bases in the remote places. Based on this experience, detailed plans have been prepared for vital base facilities — such as emergency ship repair facilities, ammunition storage facilities, communications stations, etc. These plans include medical facilities of various sizes and types.

The equipment and supplies for these advanced base facilities are stockpiled at various storage sites. Shortly after the Marines landed in Vietnam it was decided an Advanced Base Hospital would be needed in DaNang. It took about two months to get all the equipment and buildings over to Vietnam and it was estimated that it would take about four months to build it. After three months of work, the hospital was attacked by a Viet Cong sapper unit which destroyed many of the buildings with satchel charges. The sappers were very selective — they destroyed the surgery buildings, X-ray, the autoclave building and the bank of generators. It took about three additional months to repair the damage and complete the hospital. It had 650 beds and ten operating rooms. During its four years of operation it was the busiest traumatic hospital in the world and admitted over 67,000 patients.

To summarize our organization for support of the operating forces, we have dispensaries and hospitals located in or near major ports and operating bases. These hospitals of course provide the ultimate care for field casualties. We have doctors and dentists and corpsmen afloat, as in all Navies. When we deploy Marines, we provide medical support in various ways: the Navy corpsmen and doctors at the front lines; field hospitals of various sizes that are part of the Marine organization; surgical teams and surgical support (Nursing) teams that we add to transport ships and helicopter carriers; hospital ships — which can function either as true floating hospitals or as large ambulance ships; and finally, Navy Advanced Base Hospitals. This is the



ICU (Intensive Care Unit) in a HOSPITAL SHIP.



Support area of former NSA Hospital, DaNang, RVN. Staff personnel quarters are noted in the upper left of photo and Preventive Medicine Unit appears in center.

pattern we have followed in Vietnam.

What have we learned?

(1) First, the helicopter.

These wonderful machines completely change the evacuation picture. Patients can be picked up in the field — often only a few yards from where they were wounded — and flown directly back to rear area hospitals, hospital ships, or large combat ships with medical facilities. The helicopter eliminates the laborious litter-carry back to the Battalion Aid Station, and the subsequent rough ride by field ambulance to rear facilities. Our doctors and corpsmen at these Battalion Aid Stations rarely saw any wounded men — the helicopters usually flew them directly to the rear. Most of our Battalion Aid Stations were used simply as local dispensaries. Thus when helicopter evacuation is available, the numbers of doctors and corpsmen at Battalion Aid Stations can be reduced.

The same is true of the small 60-bed field hospitals or "Collecting And Clearing Companies" as they are called in the USMC. Since helicopter evacuation is so much more rapid than road ambulance, there is less requirement to have multiple small hospitals. They are much more effective when combined to form a large rear area hospital. At times, when a particular regiment was a long distance from main Headquarters, we did establish either a 60-bed "Collecting and Clearing" Company hospital or small emergency resuscitation and surgery detachments between the front lines and the rear hospitals, particularly if we expected many casualties. These were infrequently utilized in recent years. Even with severely wounded men it was generally found more desirable to fly an extra 10 or 15 minutes to get the casualties to a large completely equipped hospital, rather than delaying for an intermediate stop.

Helicopter evacuation requires positive medical control. In the beginning Marine helicopter pilots often had a tendency to land patients at the first medical facility they saw. This was bad because that facility might already be overcrowded, or might not have the right kind of specialist. At other times, helicopter pilots would feel that a patient had to be returned to his parent unit — a Marine who had landed from a helicopter carrier might have been taken back to that carrier even though a hospital ship or a field hospital may have been closer. To avoid these situations, positive medical coordination of helicopters transporting the wounded is required. In the U.S. Army, certain helicopters are designated as ambulance helicopters, are marked with the Geneva Cross and actually belong

Clinical Area of former NSA Hospital, DaNang, RVN.

to the medical department. Naturally, they are under medical control at all times. In the U.S. Marine Corps, a certain number of helicopters are set aside each day for ambulance duty. In addition, supply helicopters carry patients on their return trips. A system of medical coordination with the air controllers was worked out, which ensured that the patients were delivered to the most appropriate facility.

Each hospital and hospital ship was provided with a special radio, and a central "Medical Regulating Office" was set up. After a helicopter picked up a patient in the field, the pilot would ask the medical regulator where the patient should be taken. The regulator, by use of other radio circuits and telephone lines, knew at all times what the surgical loads were in the various hospitals, where the neurosurgeons and eye surgeons were, etc., and could provide this information to the pilot. This system worked very well for the 11 months that it was in operation. Over 17,000 patients were directed to the best receiving facility. The system is now recognized as an essential part of the total medical support system. One point I would like to emphasize is the fact that helicopter transportation is so rapid that the Medical Department must have its own communications circuits, completely dedicated to medical message traffic. No delays can be tolerated; the helicopter pilot must receive directions promptly. This can only be assured with circuits specifically assigned to the Medical Department. Of course, arrangements must be made so that the air controllers can override medical advice in case the weather is bad at the recommended location, or the mission will tie up the helicopter for too long, or involves flights thru artillery fire, etc.

Similar arrangements must be made with casualty receiving ships, and here some problems arise. Under the terms of the Geneva Convention, hospital ships may not be equipped with code machines. On the other hand, combat ships send most of their messages in code and are understandably reluctant to disclose their positions in uncoded messages. Also, some field commanders feel that disclosing the number of wounded via uncoded radio conversations with helicopter pilots may give the enemy an advantage. Thus, it may prove necessary to provide two medical circuits — a coded circuit for talking to most ships, and an uncoded circuit for talking to hospital ships.

A careful study of over 1,600 helicopter ambulance

flights by CAPT Richard E. Luehrs, MC, USN, showed a median time of 62 minutes intervening between the time of wounding and arrival at a hospital. Over half of this time was due to communication delays at various points in the chain. This is an area requiring improvement.

In addition to special communications requirements, helicopters give rise to other problems. They are most vulnerable to enemy fire while landing and taking off. Therefore, the movement of patients onto a helicopter must be as rapid as possible. Corpsmen and ground troops must be trained to give helicopter pilots a quick, accurate briefing about the conditions in the emergency landing zone, and of course, helicopters should only be called for urgent cases if the local battle is still in progress. Continuous emphasis must be placed on proper determination of the evacuation priority of patients. Helicopter crews should not be called upon to land at great risk to themselves to pick up a patient who could easily wait another hour or two, until the fighting has slackened off.

From the purely medical point of view, it must be recognized that helicopter evacuation increases the number of very serious cases seen by the surgeons. Wounded men who would not normally survive several hours of surface ambulance evacuation now arrive in

View of hospital ship from approaching helicopter.

Marine Helicopter, CH-46, as it arrived aboard REPOSE.

the receiving room of the hospital alive, but often in extremis. The fact that such seriously wounded patients are received means that more sophisticated medical equipment must be available. A field or Advanced Base Hospital can no longer be a limited-service, emergency-type hospital. It must be fully equipped and, if anything, the intensive care unit must be even more elaborately equipped than a hospital back in the U.S. The equipment we had in DaNang, to support our most seriously wounded patients, has never before been seen in a temporary field or Advanced Base Hospital.

One other problem arising from use of helicopters should be mentioned. The downdraft from the whirling blades raises tremendous clouds of dust, sand and flying debris. Therefore, the helicopter pad should be paved, if possible. The blast from the helicopter blades is strong enough to blow down tents. Loose, flying canvas is very hazardous to the helicopter — it may be sucked up into the blades and cause the aircraft to crash. Because of the great dust storms caused by the helicopters, operating rooms must be sealed and equipped with a filtered air supply if gross contamination of the operating field is to be avoided. The U.S. Army has developed portable operating rooms which solve this problem. The use of tents as surgical operating theaters must be considered unacceptable when helicopters are used as ambulances. Final plans to reequip the USMC with the Army-developed system are being formalized.

When helicopters are available, they permit sweeping changes in field medical organization, and confer great benefits to patients through rapid evacuation to full service hospitals. They can fly in quite bad weather, but not all weather. Our greatest concern is their vulnerability. We fear that small antiaircraft weapons may become available to enemy forces which could preclude the use of helicopters. We cannot afford to assume that helicopters, or something similar will always be available in the future.

Another great change in medical support of the operating forces is the ready availability of rapid long-range air evacuation. This service is provided to all units by the U.S. Air Force. The actual control of patient destinations, etc., is vested in a tri-service organization called the Armed Services Medical Regulating Office. Through its field branches, our wounded men are scheduled on a daily basis, for transport to the hospital nearest their respective homes and best equipped to provide the care they require. In general, our surgeons prefer to evacuate their patients initially to a

Patients arriving aboard REPOSE in an Army "DUSTOFF" helicopter.

Standing before a Battalion Aid Station near Vandegrift Combat Base is CAPT Ben Eiseman, MC, USNR (center). Standing on the right is the author, CAPT J. H. Stover, Jr., MC, USN.

halfway point, such as the Naval Hospitals at Yokosuka and Guam, for a few days of stabilization before completing the trip to the United States. Early evacuation of the seriously wounded is the rule — a day or two after major surgery, the patient is on his way home. The availability of such excellent evacuation service has lessened the number of hospital beds required in the combat zone.

Later in the program, some of the speakers from the U.S. Delegation will address special professional problems, such as blood supply. Let me touch very briefly on some of our major clinical problems. We encountered a great deal of falciparum malaria in the northern provinces. Our weekly Chloroquine-Primaquine prophylactic pill was unpopular with many of the men because it caused gastric discomfort and loose stools. Considerable command emphasis was required to enforce taking of the pill. Among Marine patients, we were able to demonstrate by urine tests that a majority of those who developed clinical malaria had not taken the pill. However, many who did come down with malaria HAD taken the pill, and there is a substantial possibility that Chloroquine-resistant strains of malaria occur in the northern provinces. In our limited field studies we were not able to substantiate the contention that sulfones such as Dapsone offered any advantage over Chloroquine-Primaquine for malaria prevention.

Fevers of unknown origin were numerous. Elaborate laboratory studies conducted by Naval Medical Research Unit No. 2 showed that about half of these were unrecognized malaria. A quarter were various diseases such as leptospirosis, Japanese B encephalitis, Tsutsugamushi fever, mononucleosis, dengue, and toxoplasmosis. The remaining quarter could not be identified.

Although plague was common in the Vietnamese villages, only two or three Marines developed the disease, even though many small Marine units lived in such villages for extended periods.

Heat stress occurred often. Marines carry about 80 pounds of battle equipment, and water and salt discipline are very important.

Acne was a major problem. Most of our troops were young men between 18 and 22 years of age, and many had this common skin disease. Moderate acne would frequently become severe in the moist tropical climate, and often incapacitating. Although it would improve greatly with treatment in an air-conditioned

ward, it would usually recur if the man were sent back to his unit. We were forced to evacuate hundreds of men because of this usually mild skin disease.

Tropical immersion foot was a new disease for us. Troops operating in wet paddies — or during the monsoon season, when everything was wet — would develop an incapacitating foot condition, often complicated by fungus infection. Silicone protective ointments, oral Griseofulvin, and canvas-topped boots offered some protection. However, as a general rule, we found that it was unwise to expose a unit to more than four or five days of activity in which their feet would be continuously wet.

I will not touch on surgical problems, except to note that multiple simultaneous operations were very common — it was not at all unusual to have three or even more teams of surgeons working on a single casualty at the same time. This procedure requires a large operating room. We now consider that field and shipboard operating rooms should be at least six or seven meters square.

Because many of our men received multiple wounds by fragmenting munitions, the X-ray machine was indispensable. Since it was not unusual to take 20 or more exposures, surgery was greatly accelerated by the use of rapid automatic X-ray-developing machines. We are now specifying more powerful X-ray machines (300 MA) on ships, as well as the automatic developing tanks.

Because of the great amount of traumatic surgical experience accumulated in Vietnam, annual surgical conferences have been held. Participants included surgeons actively working in Vietnam, as well as surgeons from hospitals in this country who received casualties after their initial treatment in Vietnam. Four of these conference proceedings have now been published, and contain the latest views and opinions on surgical care of battle injuries. The participants included surgeons from all of our military services. (Section reports of the CINCPAC Fourth Conference on War Surgery held in Feb. 1970 have been reproduced in this publication, April, 1970—Jan. 1971.)

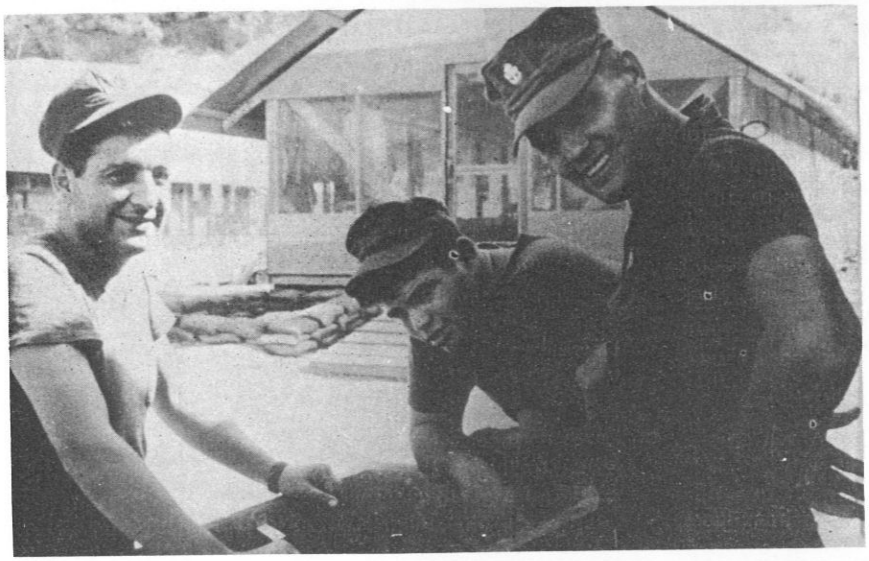
In conclusion, the lessons learned in Vietnam indicate that when helicopter evacuation from the battlefield is available, definitive medical support should be consolidated in the rear. This provides a greater variety of professional services, laboratory support, etc., immediately available for the care of the seriously wounded patient. The conflict has also established once again the essential role of the back up facilities such as advance base hospitals, hospital ships and seaborne facilities. The number of hospital beds actually allotted to Marine organizations does not provide the holding capacity — or for that matter even the initial surgical capability — for combat operations. Even the back up facilities are highly dependent upon a continuously available chain of long range evacuation to area and U.S. hospitals. In any but the shortest assault operations, disease is still a major source of medical work load — and malaria is still a major concern for military commanders.

DENTAL LESSONS LEARNED IN VIETNAM

By CAPT Franklin R. Ruliffson, DC, USN, Deputy Director, Fleet and Marine Corps Medical Support Division, BUMED.

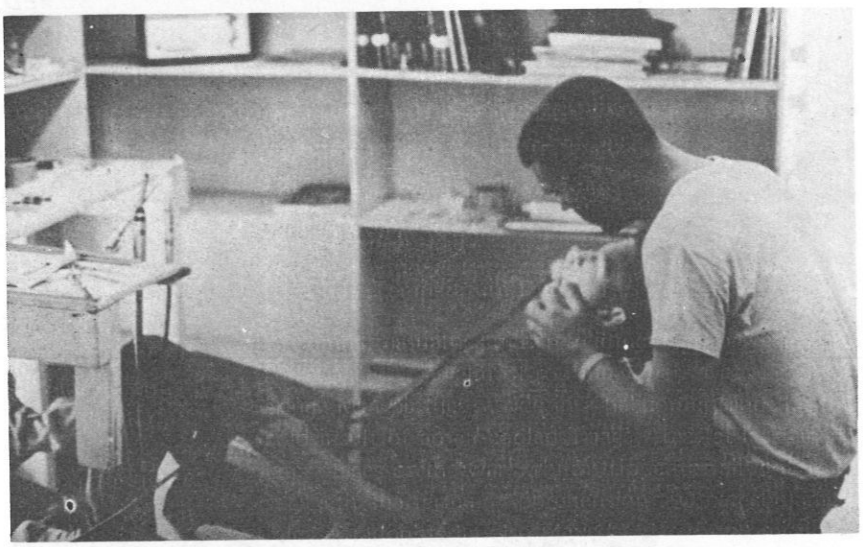
A significant result of the deployment in Vietnam was that the Force Dental Company concept functioned well and proved to be a flexible means of providing dental manpower in support of the Fleet Marine Force. Authorized in 1955 and composed of 25 officers and 46 enlisted personnel, the dental companies supported two divisions, an Air Wing and Force Troop Elements in Vietnam. Designed to attain maximum utilization of professional dental manpower and under command of the Division or Wing Dental Officer, the companies were sent out in detachments to provide support under all conditions. The detachments ranged from several personnel operating in Southeast Asia huts or old French buildings in Chu Lia, DaNang, Phu Bia, or Quang Tri, to one dental officer and technician in mobile and fixed dental clinics in Khe Sanh, Cua Viet, Con Thien or An Hoa. Specific problems encountered were lack of adequate mobile dental shelters and frequent periods without a source of electrical power.

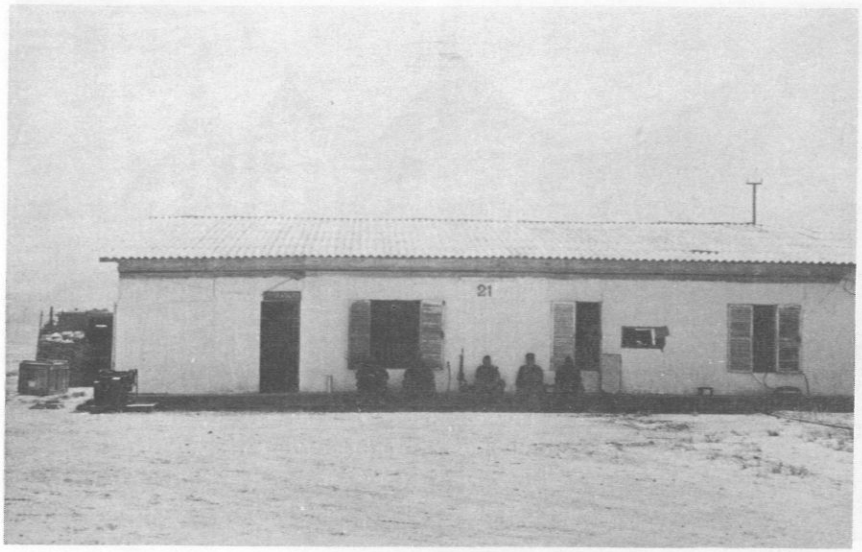
1. Award Ceremony, 1st Dental Company, 1st Marine Division.



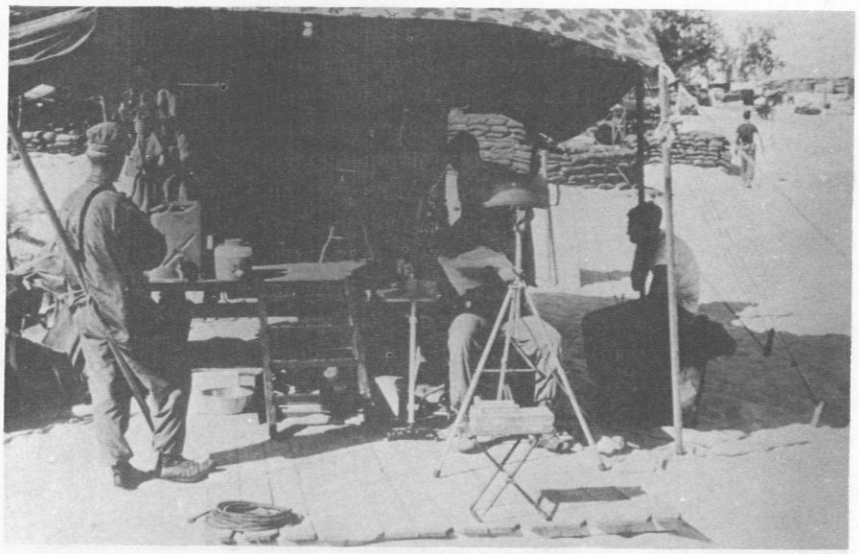
2. Dental technicians grouped in front of SEA (Southeast Asia) hut of the type used for Dental Clinics.

3. Dental treatment in a SEA hut.

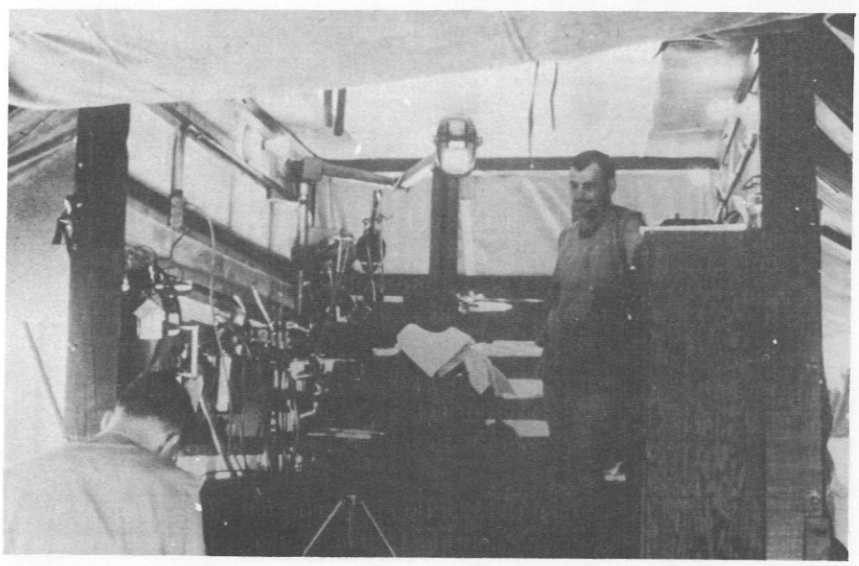




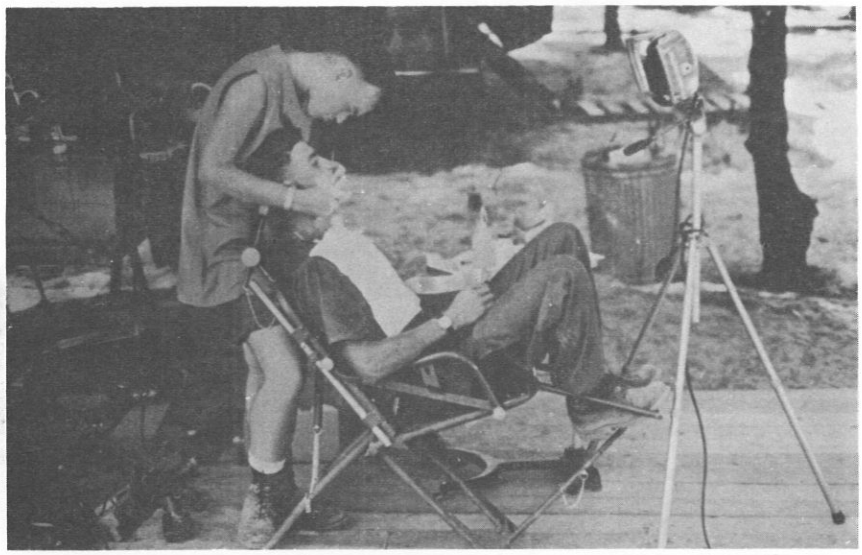
4. French building converted to a Dental Clinic at An Hoa. Note tile roof and gutter at the foundation of the structure.



5. Mobile Dental support at a Fire Base.

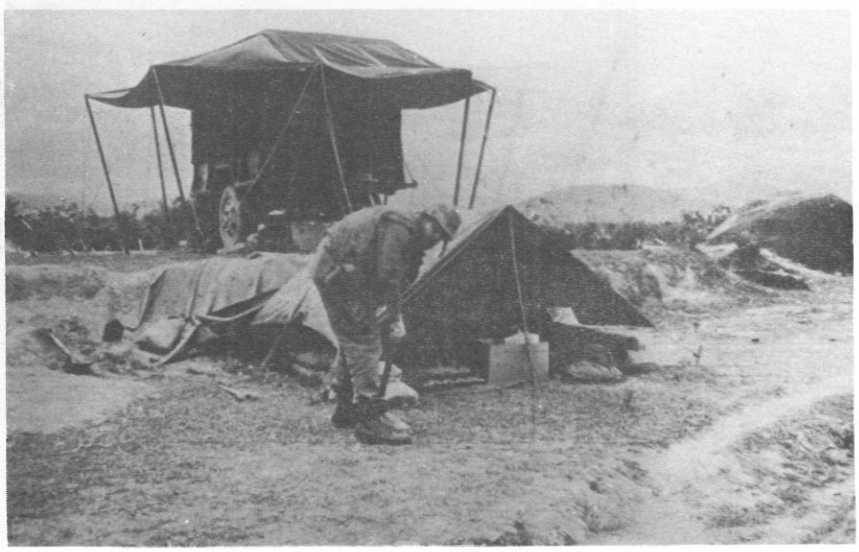


6. Dental Officer and technician hold Sick Call in a mobile Dental Trailer.



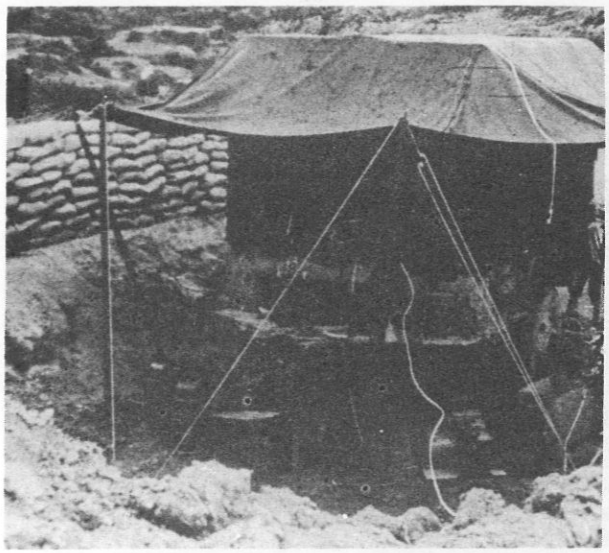
7. Dental treatment "in the open".

8. Strongback shelter used as a Dental Clinic.



9. Mobile Dental Clinic on two wheels which can be transported by helo to Fire Base.

10.—16. Operation Circuit Rider Utilizing Mobile Dental Trailers.



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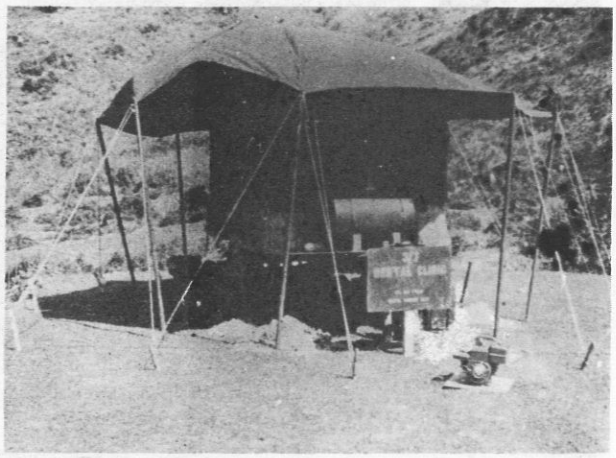

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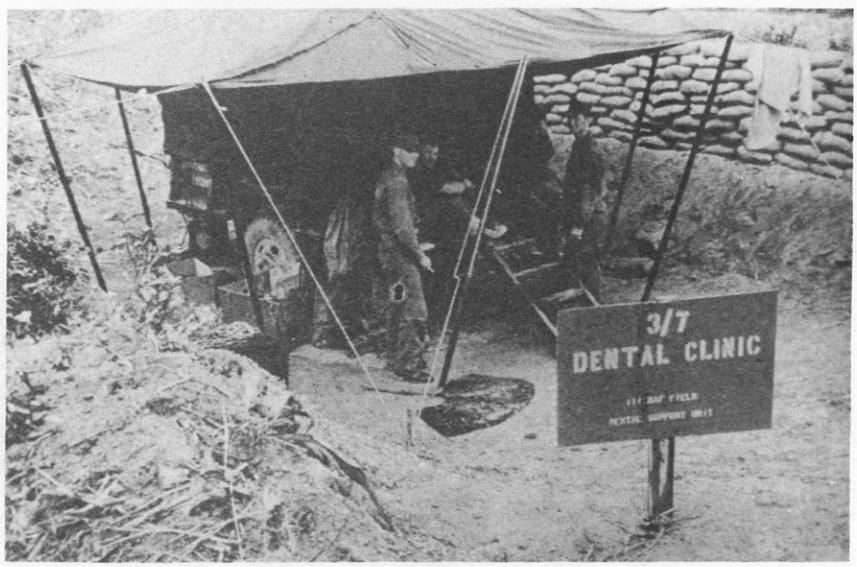

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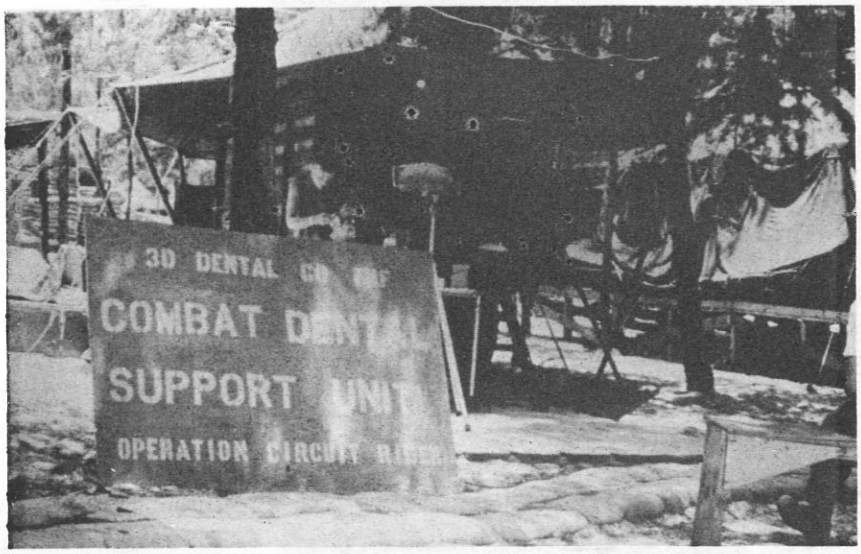

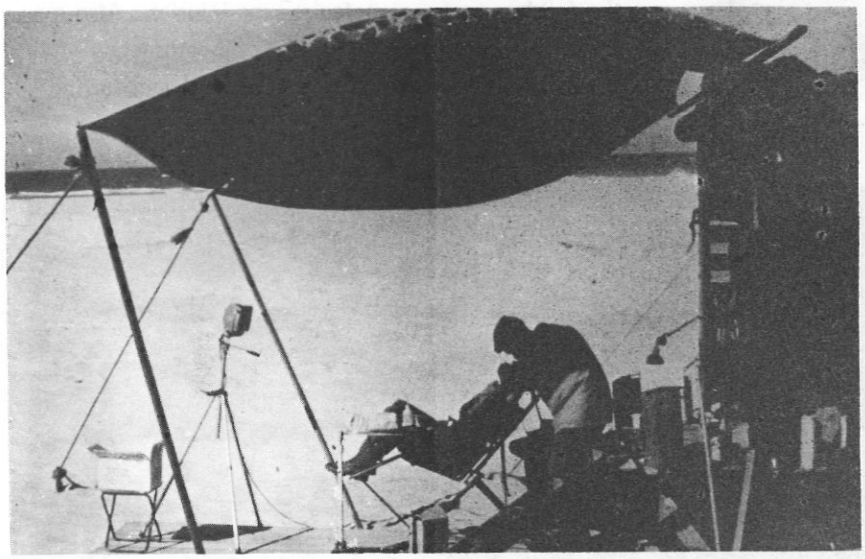

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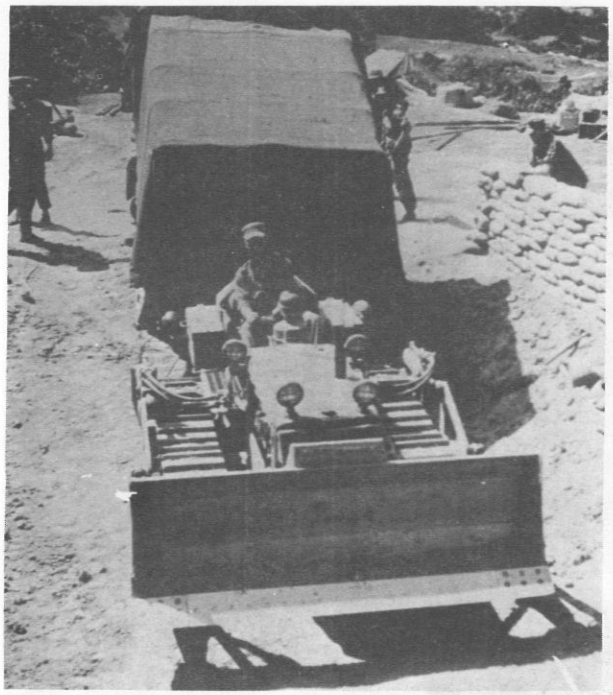


17. "Digging in" a Dental Clinic.

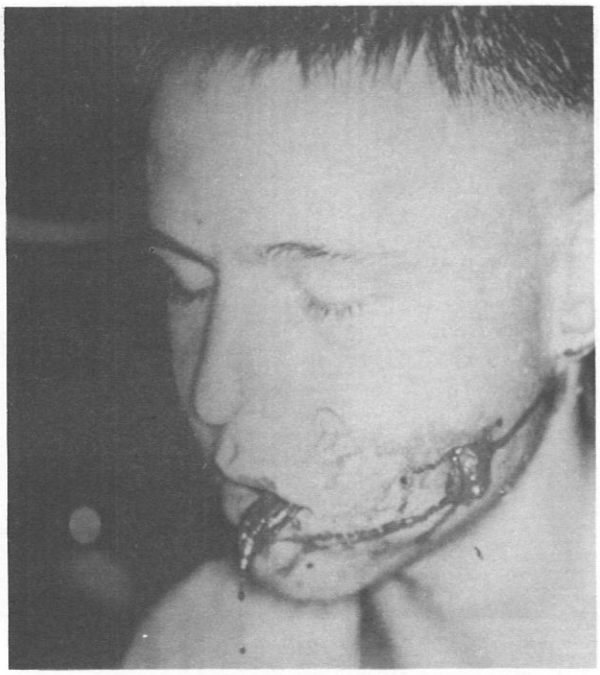
The enemy in Vietnam perhaps established a record for variety of weapons used such as pistols, rifles, machine guns, rockets, mines, and bombs of practically all known foreign manufacture. Consequently, no portion of the body escaped injury and reports show a diversity of maxillofacial wounds. Some of the reported statistics are:

1. 10% of all patients admitted had maxillofacial injuries.
2. 68% of these injuries were the result of hostile action.
3. 96% of the maxillofacial injuries from hostile action were due to missiles.

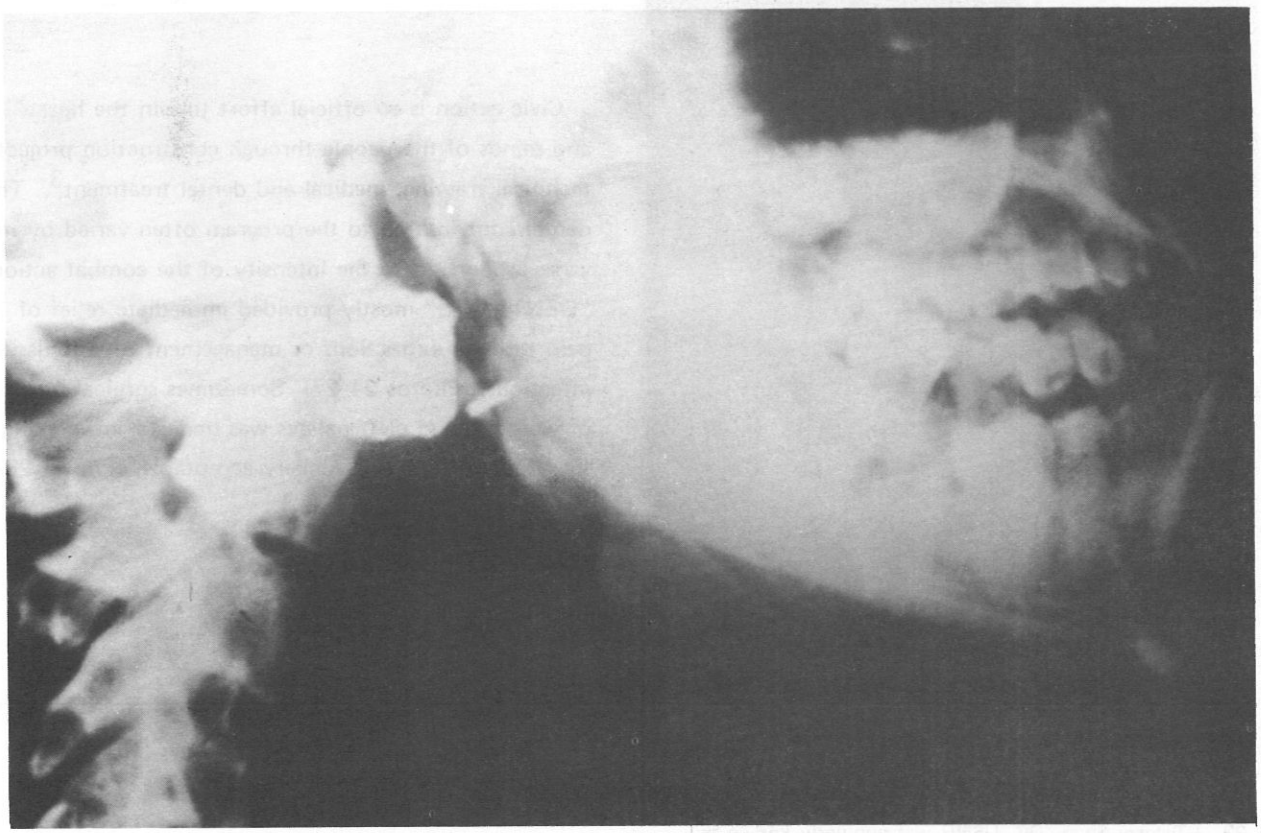
These statistics[1] demonstrate the requirement to maintain in the Naval Dental Corps an adequate source of trained oral surgeons with experience in managing the full range of maxillofacial type injuries. Also maxillofacial treatment facilities must be completely equipped and staffed with dental technicians having operating room experience.

18. Dental Trailer dug in at Khe Sanh in June 1968. Surrounding terrain is all rubble. Aircraft was usually hovering above to evacuate the seriously wounded.

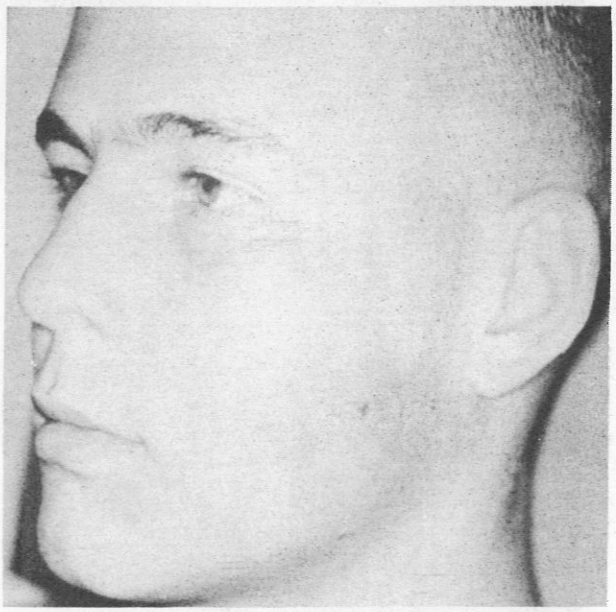
The helicopter, trained oral surgical teams and adequate facilities such as those on the hospital ships made it possible to render early definitive care of patients with maxillofacial injuries. Photo 19 reveals a young Marine who received such an injury which included: left cheek laceration, fractured posterior teeth, nearly complete severance of tongue superior to the base, mandibular and maxillary bone fractures, and right throat wound. Overall treatment time is significantly reduced when hospital ship facilities are available. Results of treatment are further enhanced by follow-up care which is rendered by the oral surgeon who provided the original treatment. Photo 21 demonstrates the 6-week postoperative result (left cheek) achieved in the patient shown in Photo 19. Photo 22 reveals the postoperative status of the right neck in the same case. This member, and many similar patients, returned to duty in Vietnam following treatment for maxillofacial injuries[2].



19. A typical maxillofacial injury to tongue, teeth and jaws. This injury was treated in USS Repose by CDR B. C. Terry, (now CAPT) DC, USN, and supporting staff.



20. X-ray study of patient shown in Photo 19 revealed missile fragment lodged in right neck.



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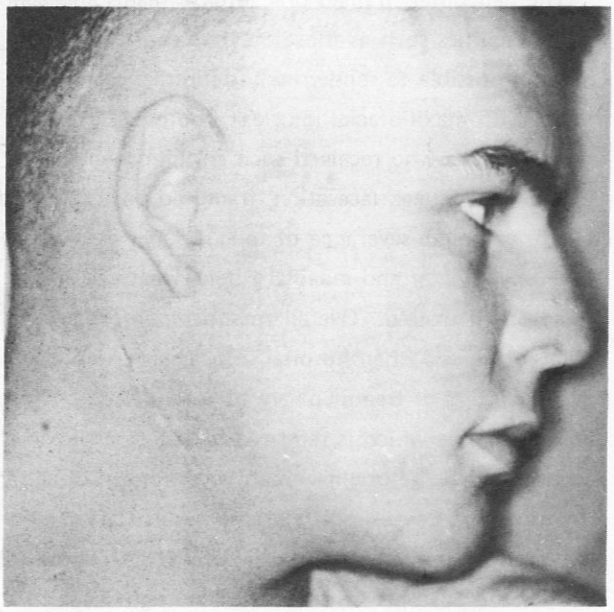

22.

23. LT Jerry Shaw, DC, USNR was popularly known as "Bac Si Jeddy Shaw".

Civic action is an official effort to win the hearts and minds of the people through construction projects, technical training, medical and dental treatment[3]. The dental contribution to the program often varied by inverse proportion to the intensity of the combat action. "DENT CAPS" mostly provided immediate relief of pain through extractions or management of soft tissue infections. (Photos 24–27) Sometimes surgical repair of cleft lips and cleft palates was undertaken, making these outcast children socially acceptable. (Photos 28–32)

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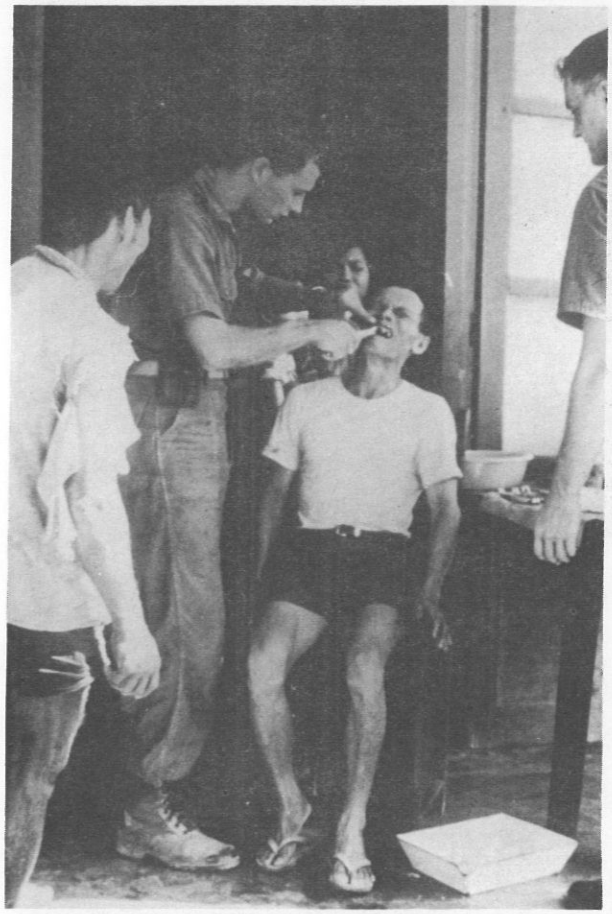

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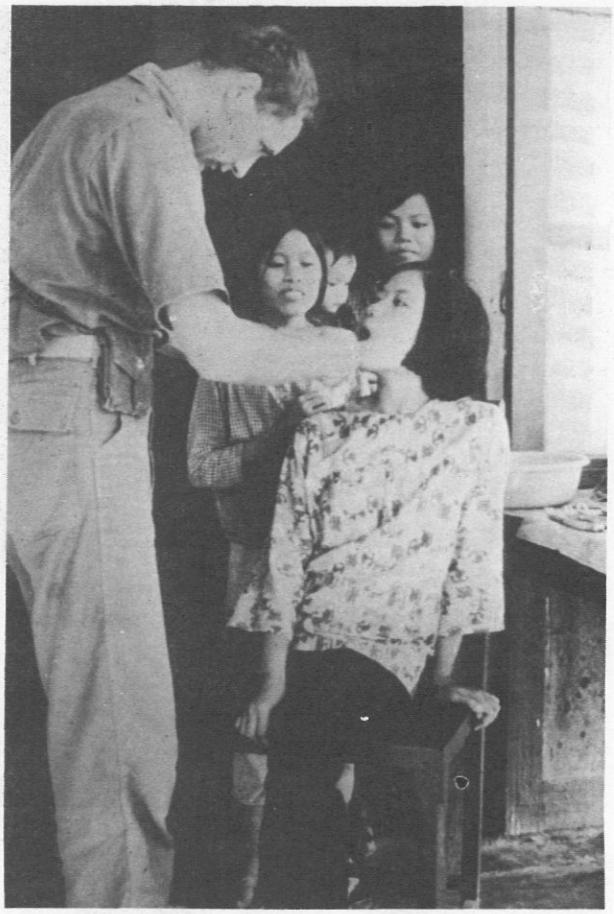

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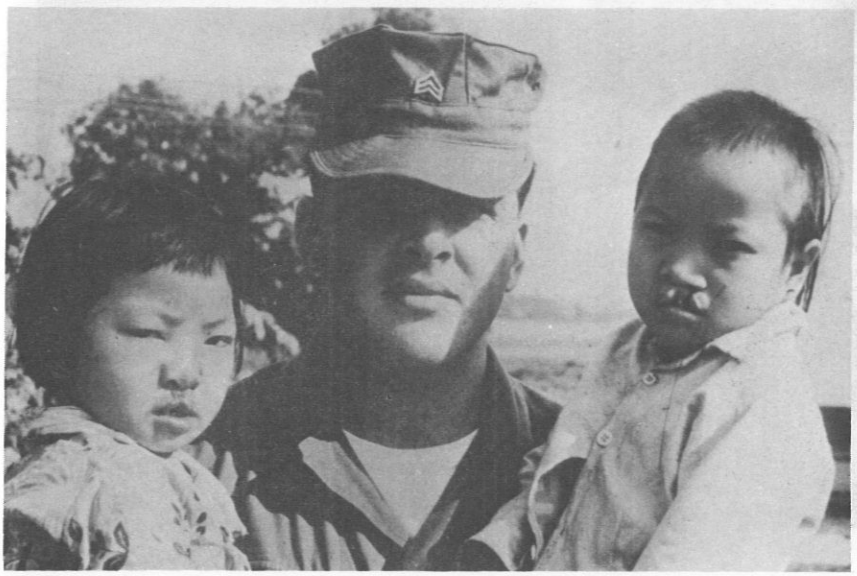
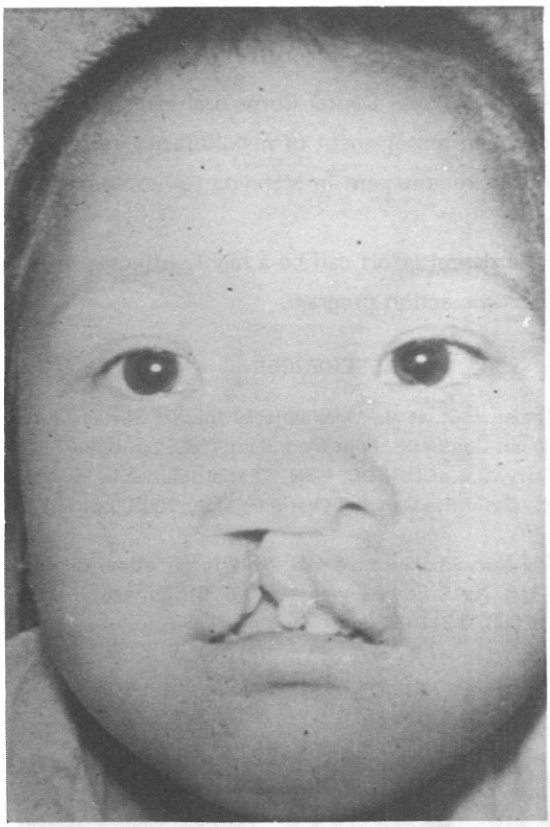


28.—32. "Sometimes surgical repair of cleft lips and cleft palates was undertaken, making these outcast children socially acceptable."



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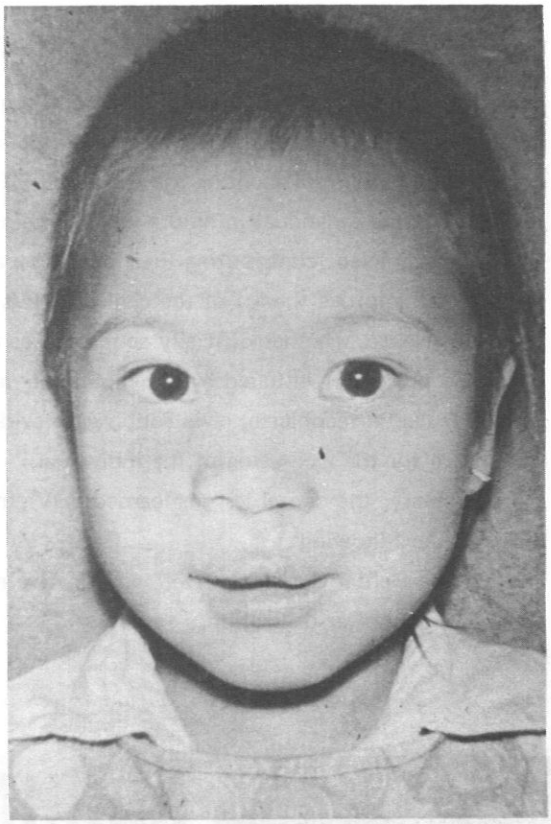

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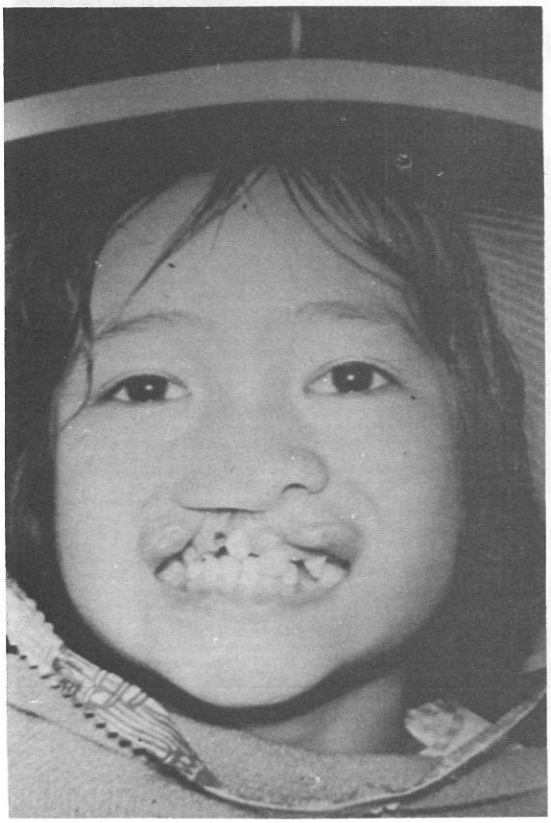

31.

32.

The effectiveness of the Dental Civic Action Program depended mainly on the enthusiasm of those personnel administering and implementing the program. Often the efforts were individual in nature with dental officers and technicians contributing their own time and resources to improve the lot of the civilian adults and children. Hence, whether officially sponsored as a command project or initiated by a sympathetic dental officer or dental technician, civic action gave evidence of concern for the well-being of the individual.

In summary, the dental lessons learned in Vietnam included the following:

1. Force Dental Companies were an effective means of dental manpower utilization.

2. Training Naval Dental Corps oral surgeons in the treatment and management of maxillofacial injuries is a significant requirement in planning for combat casualties.

3. The dental effort can be a highly effective portion of a civic action program.

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1. Tinder, L.E., et al., "Maxillofacial Injuries Sustained in the Vietnam Conflict." Milit Med, Sept 1969, pp. 668-671.

2. Terry, B.C., CDR, DC, USN, "Facial Injuries in Military Combat: Definitive Care." J Oral Surg, July 1969, pp. 551-556.

3. "The Navy in Vietnam", U.S. Navy Information, Commander U.S. Naval Forces, Vietnam; U.S. Government Printing Office: 1968, 0-313-073.

CDR (now CAPT) Jeff Hardin, DC, USN visits with Vietnamese dentist.

TERRA INCOGNITA

By CAPT B. Eiseman, MC, USNR, Professor of Surgery, University of Colorado Medical School, Denver, Colorado 80220.

Cartographers in the 14th Century marked areas beyond their geographic certainty as *terra incognita*. I have always thought such honesty in recording the boundaries of existing knowledge was an important preparation for the advances that followed shortly thereafter in the form of the Renaissance.

Now that the Navy Medical Corps' role in casualty management in Vietnam gradually draws to a close, it seems an appropriate time for us to review in a critical manner our performance during these years of intense surgical activity. Future advances will not come from dwelling on our successes, but rather in more accurate definition of where we failed. We, as the ancient cartographers, must have both the insight and the honesty to describe our current surgical "*terra incognita*." Hopefully, this will provide the needed scientific basis for subsequent surgical advance and better future combat casualty care.

I. Initial Resuscitation

Initial resuscitation with crystalloid solutions such as lactate saved the lives of thousands of combat casualties in Vietnam. Its limitations were promptly defined when overenthusiasm occasionally led to overadministration and respiratory insufficiency.

Lactate is a good, if not an excellent, fluid for administration in the Triage Area. A better one should be found. The perfect fluid for initial resuscitation should have a good oncotic pressure, remain within the vascular space with some degree of permanence, be free of virus, be available without matching, carry oxygen and carbon dioxide, not interfere with clotting or matching, be cheap, easily supplied logistically, and be usable in all extremes of temperature. Criteria for such an elixir certainly are, as yet, hidden within the boundaries of "*terra incognita*."

The above address was delivered by the author on 10 Feb. 1971, at the Visiting Professors' Program sponsored by the Surgical Service, Naval Hospital, NNMC, Bethesda, Md. It is reprinted here through the courtesy of the author, recently selected to RADM.

II. Body Temperature During Resuscitation

Combat casualties under treatment in the receiving and Triage Areas almost routinely were wet and shivering. Wet clothes, a ride in a helicopter, and the final cold insult of an air-cooled Triage Area (at least in the later stages of the war) while stripped of all clothes, set teeth chattering. Apprehension and catecholamine release undoubtedly also played a part in promoting shivering in these casualties seen such a short time after injury.

Shivering is a metabolic luxury the severely injured cannot afford. The anesthetized patient acts, in part, like a poikilotherm, but the alert casualty uses calories and high-energy phosphate bonds trying to keep warm which were better spent on fighting the ravages of blood loss.

The practical solution in a war zone may be no more complex than keeping the Triage Area at a temperature optimum for the shocked patient rather than for the attending surgeons and corpsmen.

III. Monitoring

Increasingly more accurate means for quantitating and recording a patient's reaction to injury have historically led to improved therapy. Only objective data provides a scientific basis for improvement. Historic identification of progress reminds us of the importance of such recordings. General observation was succeeded by measurement of the pulse, then arterial pressure, pressure at the elbow, urine output, central venous pressure, arterial pH, and now blood gas measurement.

The current problem for both civilian and military surgical investigators is to identify new measurements that will lead to further advances in therapy. Current style is to emphasize measurement of trauma at a cellular level. An example of a good idea which has not proven to be of much clinical value is the concept of excess lactate. The initial enthusiasm for the prognostic value of lactate/pyruvate ratio has proved to be disappointing. The concept remains good: only the

metabolic by-products measured have proven to be of limited value. Currently there is enthusiasm for measuring cell surface pH, pO_2, or membrane potential. Which, if any of these, will prove clinically helpful remains to be defined.

Spectacular advances in biomedical engineering during the past decade have set the stage for novel, sensitive, and immediate recording of subtle biologic changes. Once we, as surgeons, have become more comfortable with the hardware, perhaps we will lose our preoccupation with the gadgetry and be more imaginative in discovering novel and useful measurements of cell or organ activity which will provide more sensitive means of detecting physiologic response to trauma.

IV. Clotting Abnormalities

We live on a knife-edge ridge threatened on one side by clotting and on the other by bleeding to death. Trauma understandably upsets our delicate balance. Current progress in keeping increasingly more seriously wounded patients alive enlarges the number of patients at risk, both by their exposure to massive hypotension and trauma, and to the myriad of drugs administered them which may be thrombogenic.

An ill-defined group of clinical syndromes characterized by too much bleeding or too much clotting has been dignified by the title of diffuse intravascular clotting. Neither capitalizing the title nor abbreviating the name clarifies pathogenesis. Indeed, as usual, the correlation is a negative one. The misunderstanding is worsened because the sign posts hematologists use to guide their groping through this unknown land are primarily inscribed only with Roman numerals which confuse more than help most surgeons.

The importance of increased clotting following trauma is highly debatable. On the one hand it is clearly protective to minimize blood loss. On the other, excessive clotting can produce diffuse intravascular thrombosis, causing multiple organ damage. Resistance of hypotension or shock to ordinary forms of therapy has been ascribed to such diffuse microthrombosis. Details of such clot formation remain to be defined. Some clots undoubtedly are due to hypercoagulability; others may arise from transfused blood passing through inefficient filters.

The other side of the ridge—abnormal bleeding—is equally dangerous! Measurement of fibrinolysins, protein split products, and quantity and quality of platelets are beginning to isolate the hematologic defect. Relative ineffectiveness of treatment by the surgeon faced with a severely injured patient who, quite inexplicably, begins to ooze from every raw surface confirms the state of ignorance surrounding this problem.

V. Respiratory Distress

Enormous attention has recently been given the respiratory distress that occasionally accompanies nonspecific major trauma. There is increasing evidence that the clinical syndrome is the final common pathway for numerous types of injury. It is as though the lung has only one pathologic way of responding to insult. No matter what the insult, the cheeks flush: the lungs when similarly are insulted, they fill with salt water!

Because of association with severe injury in the early days of the war, the syndrome was called shock lung. This is almost certainly a misnomer for neither hypotension, low pulmonary artery flow, acidosis, nor hyperbaria produce the lesion. Possible factors which can contribute to its production include intravenous water overload, sodium overload, direct thoracic trauma, fat emboli, emboli of other blood elements, and occasionally oxygen toxicity.

Besides better understanding of pathogenesis, two practical problems exist for the clinician dealing with the adult respiratory distress syndrome (RDS) following trauma. They are first, its earlier detection and second, its more effective treatment.

Early diagnosis of RDS is important so that the vicious cycle of fluid accumulation in the lung and hypoxia which, in turn, begets more fluid shifts, can be interrupted while the lesion is reversible. Clinical signs and symptoms lag behind fluid shift pathology. There may be no rales, frothy sputum, or even changes in breath sounds until diffuse lung involvement is presented. Radiographic evidence is unreliable, as are blood gas or CVP determinations so long as the patient has significant ventilatory and cardiac reserve.

Our efforts are directed to detect early salt water accumulation within the chest by measurement of electrical impedance across the thorax, a change which apparently precedes alteration in blood gases.

Treatment of RDS despite advances in the use of mechanical respirators is far from optimal. The potential reversibility of the pulmonary lesion creates a therapeutic challenge—one that probably will not adequately be met until extracorporeal oxygenation can safely be maintained for several days while the pulmonary lesion mends. Until that time, pulmonary insufficiency remains as the ultimate cause of death in many of the severely injured.

VI. Fat Embolism

The enigma of fat embolism is a degrading blot on the intellectual escutcheon of the orthopedist and the traumatologist. Not even the source of the fat has been identified despite decades of argument based on

appallingly little hard data. Bone marrow is the obvious site under suspicion, but factors such as timing of fat showers, inexact correlation with long bone fracture, and association with injury to bones whose marrow contains no fat all throw serious doubt on this simplistic explanation. The alternative theory of genesis suggests that trauma destroys the stability of fat emulsion in the circulating blood. More precise bioengineering means for monitoring fat emulsion stability or fat particle appearance in the blood from an injured extremity should help clarify this classic problem.

It is no wonder with etiology still obscure that prevention and treatment are ineffective. Pulmonary manifestations of fat emboli are often of critical importance and can be treated as previously described with mechanical respirator support. But what is needed in the future is a means to prevent or reverse the basic biochemical lesion, not merely its clinical manifestations.

VII. Infection

Bacterial infection continues to be a prominent complication of war injuries. According to the 1970 Conference on War Surgery, subphrenic abscess developed in 7% of all laparotomies for combat injuries. There is a 72% incidence of wound sepsis for right colon injuries. Every carefully documented follow-up substantiates the continued high-incidence of wound infection — a fact almost unbelievable to those who perform the initial surgery, but thereafter lose the humiliating chastisement of subsequent follow-up. Surgeons working in Japan and in military hospitals within the continental United States know otherwise.

Two means can in the future be used to decrease the incidence of bacterial infection in war wounds. First, is the search for new and better antibacterial substances. This scientific endeavor was prominently advocated by trauma surgeons such as Galen, Pare, and Lister.

Second is the need for better operative techniques to avoid wound infection. In Vietnam, as in previous conflicts, surgeons trained in a peacetime civilian environment could not at first accept long-proven military surgical tenets. As so often in the past, many felt that techniques such as delayed wound closure, or staged management of bowel injuries reflected a professional intellectual reverse, no longer pertinent in light of modern surgical science. Such laudable intentions led to wound complications early in this armed conflict as in so many others. Spear wounds were probably mishandled in the early phases of the Peloponnesian War.

Future advances in avoiding infection clearly involve both better surgical education and improved techniques. It is difficult to imagine earlier definitive care of the combat casualty or more ideal physical facilities than those routinely provided in Vietnam during the last few years. The medical tactical situation probably never will be better for quick definitive care of the combat casualty by qualified teams using modern equipment. Realistic future surgical scenarios must include progressively less luxury in air superiority, speed of evacuation, and freedom from hospital exposure to enemy activity. Avoidance of wound infection will become progressively more difficult as each tactical factor deteriorates.

VIII. Burns

The tactical nature of this war has fortunately not resulted in as many burns as in most modern wars—at least not for our troops. Most burns have been operational accidents.

Advances in fluid and electrolyte management made death from hypovolemia in the early postburn period uncommon, even with huge burns ultimately fatal for other reasons. Such treatment requires enormous expenditure of personnel and equipment, and is unlikely to be the ultimate answer to burn care. Surely, there must be a simpler means.

Deep burns covering more than 40% of the body surface still are highly lethal— ultimately as a result of infection or its complications. The clinical challenge is to wage a successful holding action with supportive drugs, while achieving skin coverage of the burn wound. Escharattes have never offered permanent benefit. The antibacterial action of skin has never been fully explained. Perhaps immunologic and metabolic studies of skin would reveal some of its protective properties.

IX. Stress Ulcer

The high failure rate in the treatment of stress ulcer has been slow of appreciation. In part this was due to its inclusion indiscriminately within analyses of all peptic ulcers. Only when stress ulcers are considered separately will the deceptive camouflage be stripped away and the lethal nature of the disease recognized. Rebleeding rates at best are 33%. The majority of reviews report rebleeding and death rates close to 50% or 75%. There obviously is little reason for satisfaction with current treatment of a bleeding stress ulcer.

Stress ulcer is apparently a final common pathway of various types of trauma and its nature will better be understood if causes can be matched with pathology. One type specifically can be separated— that due to head injury. Unique among stress ulcers, these lesions are associated with gastric acid hypersecretion.

Parasympathetic blocking agents decrease acid pepsin secretion in such patients, but the prognosis for head injury in high acid secretors is dismal.

The vast majority of stress ulcers are not associated with acid hypersecretion. Variously manifested by diffuse erosion, multiple superficial ulcerations, or peptic ulcer with minimal surrounding inflammatory response, these lesions in the combat casualty show a significant correlation (70%) with infection. Just why is unclear.

Almost every aspect of this poorly understood and treated syndrome awaits investigation. No reliable animal model exists; the immediate etiology is unclear, cause of erosion unknown, relation to infection undefined, and optimum operative or nonoperative therapy not described. The bitterness of this humiliation is doubled by recognizing that stress ulcer often kills the very patient who has been resuscitated and kept alive by heroic surgical measures.

X. Brain Swelling Following Head Injury

No systematized listing of surgical defeats following trauma would be complete without mentioning the greatest killer of them all in combat—head injury. The common final pathway in these patients is usually swelling of the brain within a nonyielding cranium. Operative decompression is both destructive and usually ineffective, causing as much swelling as it prevents. Drugs and external agents such as steroids, hypothermia, and dehydrating or diuretic agents are of only adjunctive value. The need for new techniques is clear—their nature obscure.

XI. Nerve Regeneration

Probably no other single discovery would afford as much economic, social, and simple humanitarian benefit as would the discovery of a means to promote regeneration in a severed or damaged nerve. Paraplegics or patients with denervated limbs are so much an accepted clinical defeat that most basic investigators have lost interest in the experimental approach to this baffling problem. Merely to document its social, economic, and humanistic morbidity is depressing. A reminder of its importance may stimulate someone to solve this important enigma. A professional life could be devoted exclusively to specializing in this field.

XII. Vascular Injuries

Advances made in the treatment of arterial injuries in the 25 years since World War II must not hide the many improvements that remain to be made in the salvage of life and limb following vascular injury.

Thirty-seven percent of war injuries involving the popliteal artery and vein still result in amputation. The complacent vascular surgeon need only visit an amputee ward to recognize the challenge.

Principles and techniques for major arterial repair are by this time standardized, but such is not true of venous injuries. The critical nature of venous injury, currently much discussed in knowledgeable circles, is totally unsupported by hard statistical data. How many legs actually are lost because of popliteal vein interruption in the combat casualty? What is a sufficient time relationship between injury and lymphatic or venous collateral regeneration to salvage an all but severed limb? What is the statistical morbidity of venous insufficiency in limbs that remain viable after arterial repair for trauma? This type of important clinical research only requires accurate records, a statistician, and someone curious enough to spend the time to make the study.

Means should be found quickly and accurately to quantitate venous drainage following severe extremity injury, to assist the surgeon in making his decision whether reconstruction of the veins is necessary.

Technique of venous repair remains debatable. Lateral suture no doubt is advisable in large vessels, but quantification of the threat of embolism is required for the technique to be objectively evaluated. If the vein is severed, many problems exist. What is the place of anticoagulation if the vein is reanastomosed or bridged with a graft? Is there a place for distal temporary arteriovenous fistula to keep a small vein patent? Prosthetic venous grafts, analogous to those used in arteries, seem to require a chemically bound anticoagulant.

Thus, despite recent rapid advances, there is more still to be learned than has already been discovered in this area of the *"terra incognita."*

Fasciotomy. The value of fasciotomy following prolonged damage and ischemia of an extremity is undeniable. Consultants, and those with the advantage of objectivity or hindsight in the care of casualties, repeatedly plead for liberal use of fasciotomy. Being so highly regarded, it is astonishing how little agreement exists regarding the indications or optimal technique for its accomplishment.

Part of the difficulty in standardizing indications for fasciotomy stems from the multitude of factors involved. This is particularly true of a war wound. Such pertinent factors include anatomic site of injury, presence of a distal pulse, degree of remaining collaterals, amount of associated soft tissue injury, time of vascular interruption, appearance of the extremity, and, of particular importance in war wounds, the intensity and

duration of the immediate follow-up which the surgeon can provide. In a combat zone, where little reliance can be placed on careful follow-up, the indications for fasciotomy where doubt may exist would therefore be liberalized.

A more objective means of indicating when fasciotomy should be performed, is needed.

The optimal technique for fasciotomy must be defined. Three are available: splitting the fascia through a keyhole skin incision; creating openings through two, or more, long skin incisions into the four fascial compartments of the leg; or fibulectomy. The latter is new, more talked about than tried and, therefore, surrounded with the usual unsupported enthusiasm for whatever is novel. It is a reasonable technique, but critical evaluation of a large controlled clinical experience with it is required.

XIII. Liver Injuries

Small liver lacerations—be they blunt or perforating—usually pose no significant problem either in civilian or military practice. Such is not the case when major portions of the liver must be removed, where mortality and morbidity remain significant.

Some of the major areas of disagreement concerning management of liver injuries can be identified as follows:

1. Débridement or Resection. The surgeon unaccustomed to dealing with liver injuries usually takes one of two courses when faced with major liver trauma. He opts either for suture or for lobectomy. Unfortunately, much recent literature reinforces this error by undue emphasis on the technique of lobectomy. In fact, a third option—wide débridement—is available and may imply far less morbidity than does formal lobectomy. To help in this decision, criteria should be defined as accurately as possible and the indications for exploration and excision deep within wounds of the bloody body of the right lobe should be included. Less than complete excision of nonviable liver leads to subsequent infection, drainage, hemobilia, or worse! But once successfully performed, with hemostasis achieved, even wide débridement carries less morbidity than formal right lobectomy.

2. Hemostasis. Although detailed line drawings describe how to achieve meticulous hemostasis in an injured liver, this ideal state is partially a figment of faulty memory. Sutures must not be strangulating, but must stop bleeding. Much of the morbidity such as prolonged postoperative drainage, results from slough of dead liver tissue produced by hemostatic sutures in the liver.

During the Vietnam conflict, hemostatic polymer sprays were investigated. Most critics have been unenthusiastic about their use, but some such technique would be valuable.

3. Biliary Tract Drainage. Biliary tract drainage has been advocated following liver trauma to minimize leakage from the resected liver's raw surface. No one seriously advocates it for minor liver wounds. Much more objective data is required to prove its beneficial effect, even following major débridement or lobectomy. Also debatable is the relative value of common duct T-tube drainage versus tube cholecystostomy. The immediate morbidity of cannulating a normal common duct must be documented. Certainly it is much easier to drain the gallbladder if this will serve just as well.

4. Drains. Although there is no argument that raw or leaking liver wounds should be drained, there is no good evidence as to how long such drains should be left in place, and whether sumps are superior to ordinary rubber drains.

None of these controversies is particularly intellectually challenging from the viewpoint of a cellular biologist, but on each depend the lives of many young men with combat liver wounds.

XIV. Hemostasis Following Pelvic Injury

Blood loss following even a simple pelvic fracture averages 1,000 to 1,500 cc. Following open injury or a high-velocity missile wound, this figure is multiplied many times. The problem is how best to control bleeding from the bony pelvis at operation. Blood, like water from the magic flute, gushes forth in large amounts and from no determinable source. Ligation of the hypogastric arteries is relatively ineffective. Packing invites infection. A new technique must be discovered.

XV. Débridement

Despite centuries of experience with war wound débridement, the technique remains an inexact art, not a science. As such, the challenge is one of how to educate those surgeons performing initial surgery, at the beginning of a war, to perform as well as those who closed the previous one. To date, no one has properly met this educational and administrative challenge. Perhaps a scientific means to help the uninitiated detect the interface between viable and nonviable tissue, would be of value. Though previously suggested many times, this has never been accomplished.

The decision is more complex when the patient may appear on the operating table, awaiting débridement, within a few minutes following injury. Demarcation obvious a few hours later, may be subtle in

outline so soon after trauma. Excessive conservatism invites subsequent infection: overenthusiastic resection increases morbidity.

The problem is compounded by the practical fact that often the less experienced medical officer is made responsible for "simple débridement", while his more extensively trained colleague deals with injuries of greater immediate threat to life and limb.

Conclusion

Most Europeans in the Middle Ages were smug in their dogmatic ignorance. There were a few, however, who set the stage for the Renaissance by being secure enough to define the boundaries of their ignorance. It is difficult for 20th Century American surgeons to admit they are ignorant! Let us, however, not be victims of our own publicity. Our performance in casualty management in Vietnam has never been equaled. Let this not be solely a source of satisfaction. Rather let it stimulate challenge to do even better next time. The way to initiate such improvement is to ruthlessly expose our own areas of failure. Just as the cartographers in the 13th Century spelled it out, let us now define the surgical regions of "*terra incognita*."

CAPT (RADM selectee) B. Eiseman, MC, USNR (to right of center) discussed hepatic wounds with members of the Shock and Resuscitation Team at Vandegrift Combat Base, I Corps, RVN, in spring of 1969. (Photo by courtesy of CAPT J. H. Stover, Jr., MC, USN.)

THE HOSPITAL SHIP DIALYSIS UNIT

By LCDR John D. Conger, MC, USN, former Officer-in-Charge of Dialysis Program in USS Repose and USS Sanctuary; now a member of the staff at Naval Hospital, Oakland, California.

Acute oliguric states and nephropathies have contributed to mortality and morbidity in war-related injuries and diseases since accurate medical recording began. During World War II, 40% of severely wounded casualties had some degree of acute tubular ischemia at post-mortem examination. In the first year of the Korean War, morphologically detectable tubular necrosis was seen in 18% of the autopsies carried out after battlefield deaths. Mortality rates among patients with acute renal failure accompanying war-related injury and disease, determined primarily by the severity of the underlying condition and associated complications, have varied from 10 to 90%.

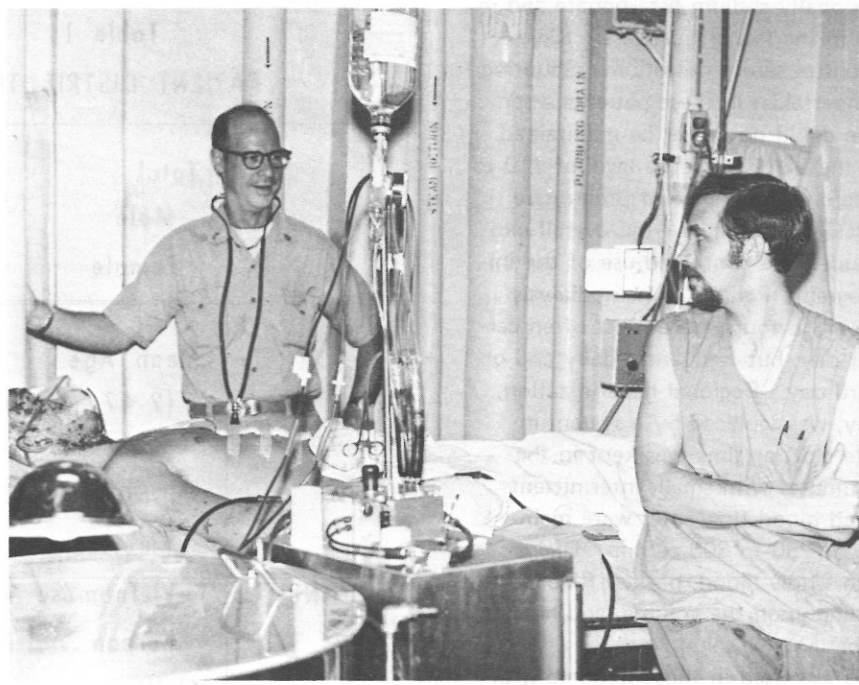
Development of effective methods of dialysis has provided an additional modality in the treatment of acute renal failure. Its adjunctive value is being evaluated in the combat setting of Vietnam. Such capabilities existed at the Army's 3d Field Hospital and aboard the Navy's hospital ships.

The purpose of this report is to present the author's experiences aboard the U.S. Navy Hospital Ships SANCTUARY and REPOSE, from January through October 1970, in the management of acute renal failure as it occurred in the battle zone environment of the I Corps region of Vietnam.

The Dialysis Unit

In January 1970 a program for the treatment of patients with acute renal failure was instituted aboard the USS Repose. When that ship left Vietnam waters in March, a similar facility was established on the USS Sanctuary. The dialysis unit was set up in a corner of the Intensive Care Unit, where intensive care and dialysis management could be combined as necessary. The unit contained two beds, bed scales, a Travenol 100-Liter Twin Coil artificial kidney and material for peritoneal dialysis. The technical staff included two nurses and four corpsmen trained in the operation of both hemo- and peritoneal dialysis.

Patients were evaluated on admission by the author. Surgical consultations were obtained as indicated.



Hemodialysis Unit in operation at U.S. Naval Hospital in USS Sanctuary.

Baseline weights were determined, followed by daily, pre- and post-dialysis weights. The following laboratory studies were obtained on a daily basis: complete blood count, blood urea nitrogen (BUN), serum electrolytes, calcium and phosphorus; coagulation studies—prothrombin time, partial thromboplastin time, fibrinogen and platelet count; blood gas studies—arterial pH, pO2 and pCO2. Routine urinalysis was performed on available admission urine as well as electrolyte concentrations and evaluation of the sediment for formed elements. Urinary myoglobin and hemoglobin levels were also determined. Cultures were taken of all wounds, drain sites, sputum, blood and urine, on admission, every three days thereafter, and at other times as clinically indicated. Blood cultures were also obtained after each dialysis. Retrograde pyelography was performed when historical factors or physical findings suggested possible obstructive uropathy.

Attempts to initiate a diuresis were made when this appeared to be clinically indicated. Agents used included plasma expanders, mannitol, ethacrynic acid, and furosemide.

The severity of the complications of renal failure presented by the patient, determined the initial modalities of therapy. Those presenting with pulmonary edema, hyperkalemia or serious neurologic manifestations of uremia underwent hemodialysis following immediate placement of Quinton-Scribner shunts in an available extremity. A program of fluid, potassium and protein restriction, coupled with high parenteral carbohydrate (occasionally sodium bicarbonate and insulin), was initiated in the less critical cases. Kayexalate was used to control serum potassium. Shunting and dialysis were undertaken in these patients when the serum potassium could no longer be maintained below 6.0 mEq/L., the BUN reached a level of 110 to 120 mg/100 ml., there was evidence of progressive wound sepsis and delayed healing, or the overall clinical condition precluded the continued use of the initial conservative program. Periods of hemodialysis varied from four to eight hours, were most often carried out every other day, but frequently daily and occasionally every third day. Regional heparinization, though used initially, was replaced by a system in which the Lee-White clotting time was kept in the range of 12 to 15 minutes with small, intermittent doses of Heparin, and blood flow rates were maintained continuously at 250 to 300 cc/min. Dialysis was carried out with whole blood, packed RBC or no coil priming depending upon the volume, and hematologic status of the patient.

Peritoneal dialysis was used in those patients without marked catabolism who had intact peritoneal membranes. The average duration of this method of treatment was 48 to 72 hours.

In addition to management of the renal failure, intensive therapy was undertaken to alleviate underlying and associated surgical and medical problems. Primarily this involved antibiotics with débridement-drainage procedures for septic complications; hyperalimentation programs to promote wound healing; ventilatory therapy for progressive pulmonary insufficiency, and; treatment of coagulopathies.

Case Material

Twenty-four patients were referred for care during the nine month period described. Table I categorizes the 24 patients by sex and national origin. The mean age was 25 years. All but five of the patients were active duty American military personnel. The referring facilities included the major military and civilian hospitals in the I Corps area of Vietnam (Table II). The mean time from injury or onset of illness to transfer to the dialysis unit was 4.5 days, ranging from 2 to 9 days. In 19 of the patients renal failure followed trauma; nontraumatic conditions were etiologically related in five cases. With the exception of two cases with extensive burns, the traumatic injury sites reflect a wide penetrating-combat-missile spectrum (Table III). In the nontrauma group, one instance of each of the following conditions was encountered: falciparum

Table 1

PATIENT DISTRIBUTION

SEX	Total	24
	Male	23
	Female	1
AGE	Mean Age (2-47 years)	25
ORIGIN	Military	22
	American	18
	Vietnamese	3
	Korean	1
	Civilian	2

Table II

REFERRAL DATA

Facility	Patients
SANCTUARY	6
85th Evac	4
NSA	3
1st Med.	6
REPOSE	2
Hue Prov.	2
95th Evac	1

Table III

FREQUENCY OF ORGAN TRAUMA

Extremities		16
Soft tissue, fractures	9	
Multiple amputations	5	
Single Amputations	2	
Bowel		12
Lung		5
Liver		4
Spleen		1
Vascular		5
Kidney		3
CNS		4
Burns		2

Table IV

RENAL FAILURE ANTECEDENTS

Transfusions	17
Hypotension	13
Sepsis	13
Antibiotics	10
kanamycin, streptomycin, gentamycin, Coly-Mycin	
Congestive heart failure	1
Hyperuricemia	1

Table V

OLIGURIA

Oliguric	21 patients
Non-oliguric	3 patients
Mean onset post injury	3 days (5-0 days)
Duration (survivors)	8.5 days (15-2 days)
Diuresis (expired)	0 patients
Survival time, of those expired	11 days (31-1 days)

malaria, reticulum cell sarcoma with hyperuricemia, methanol ingestion, acute glomerulonephritis and prolonged diarrhea with dehydration and shock.

Table IV records the total number of exposures to potential etiologic antecedents of acute renal failure that were experienced. Though nearly all patients had received blood, no transfusion reactions were documented. Hypotension of variable severity either at the time of injury or during subsequent surgery, diffuse sepsis, and brief courses of therapy with nephrotoxic antibiotics were common. No cases of obstructive uropathy were discovered.

Twenty-one of the referrals suffered an oliguric form of kidney failure. There were three patients—all with bilateral amputations of the lower extremities—who presented with rising BUN and serum potassium levels despite urine volumes over one liter per day. For those with oliguria, the mean time of onset was three days post injury or illness, with a range of 0-5 days. The average duration of oliguria was 8.5 days with a range of 2 to 15 days. Diuresis failed to occur in any of the patients who expired (Table V).

Mean admission laboratory values and ranges are shown in Table VI. The low hematocrits occurring in the majority of the patients were the result of blood loss due to trauma and a variety of coagulopathies. Elevated hematocrits were present only in the two burn cases. Elevated white blood counts reflected the septic or stress-hypoxic states in which most referrals arrived. The BUN's were not excessively elevated because of the relatively short periods of shutdown prior to transfer. Hyponatremia was common in both the trauma and nontrauma groups except for those with burns who were hypernatremic. Due to frequent nasogastric suction and intestinal diversion procedures, hypochloremic-hypokalemic alkalosis was nearly as common

initially as hyperkalemia with acidosis. Severe acidosis was observed in patients with combined massive trauma and significant hypoxemia from pulmonary complications. As can be seen in Table VI, bleeding and clotting abnormalities were frequent. The two major types of disturbance were a diffuse intravascular coagulation most often associated with septicemia, and, the factor-deficiency syndrome associated with multiple transfusions of stored blood. The single patient with falciparum malaria developed an isolated thrombocytopenia related to the disease and quinine therapy. Blood gas determinations reflect the high incidence of pulmonary problems. The usual physiologic defect was a ventilation-perfusion imbalance with hypoxia and hypocarbia. The underlying pathology in nearly every case was either severe lung contusion, necrotizing pneumonitis, or the so-called "wet lung syndrome". Urinary electrolytes and sediment analysis were of value in assessing the cause of renal dysfunction and in separating those with pre-renal azotemia from those with intra-renal pathology. Seventeen of the 20 patients with oliguria had urinary sodium concentrations greater than 20 mEq/L. Detection of typical pigmented casts of acute tubular necrosis on microscopic examination of sediment proved to be the best indicator of frank renal shutdown. These casts were found on urine examination in 20 of the 23 patients. Osmolality studies were of less help because a number of patients had received osmotic diuretics prior to admission.

Attempts to induce a diuresis were made in nearly every patient, either at the referring facility or shortly after admission to the dialysis unit (Table VII). On one occasion diuresis occurred following the use of saline and albumin in a paraplegic patient with unrecognized peritonitis and a perforated gastric ulcer. Using ethacrynic acid, a temporary increase in urine output occurred in two others, but was not sustained despite continued use of the drug. Response to diuretics did not appear to be dose related. Where transient diuresis followed ethacrynic acid therapy, only 25 mg. of the drug was given, intravenously. Subsequent trials with higher doses in these patients, and up to 150 mg. of ethacrynic acid and 160 mg. of furosemide in others, were not successful.

Table VI

ADMISSION LABORATORY VALUES

Test	Mean	Range
Hct. (%)	31	50-19
WBC (cu.mm.)	14,000	2,300-24,300
BUN (mg./100ml.)	73	150-30
Na (mEq/L.)	130	151-110
K (mEq/L.)	4.8	7.4-3.2
Cl (mEq/L.)	89	105-68
HCO_3 (mEq/L.)	19	36-6
Plt. cnt. (cu.mm.)	120,000	32,000-278,000
PT (sec.)	17	24-13
PTT (sec.)	43	55-35
Fibrinogen (mg./100ml.)	150	300-50
pH	7.30	7.50-6.91
pO_2 (mmHg.)	83	117-40
pCO_2 (mmHg.)	32	43-24
URINE		
Na (mEq./L.)	38	70-12
(> 20 mEq./L. 17 patients) (< 20 mEq./L. 5 patients)		
(Pigmented granular casts: 20 patients)		

Table VII

ATTEMPTS AT DIURESIS INDUCTION

Agent	No. times used	Successful	Temp. Successful	Unsuccessful
Plasma expander	8	1		7
Ethacrynic acid	9		2	7
Mannitol	7			7
Furosemide	4			4

Increments of blood urea nitrogen (BUN) were calculated daily for all patients (Table VIII). Though there was some overlap, it is evident that the catabolic states of tissue damage and pyrexia increased the rate of rise of the BUN. In septicemia patients with large areas of soft tissue injury, daily increases of BUN were consistently over 45 mg./100 ml. Seventeen of the 23 patients required dialysis. The remainder either did not need dialysis or expired prior to the manifest clinical indication for it. There were 49 hemodialysis runs carried out on 12 patients with an average of four dialysis runs per patient. Peritoneal dialysis was used six times on five patients (Table IX).

Pre- and post-dialysis laboratory values are shown in Table X. In general it can be seen that dialysis was effective in improving metabolic parameters. BUN and electrolyte corrections were intentionally made by small increments in order to avoid neurologic, neuromuscular and cardiac complications. The mean decrement of BUN was 52 mg./100 ml. per dialysis. There was considerable variability, however, as can be seen from the table. The amount of fluid removal was varied according to the hydration status of the patients, which accounts for the wide range of values. On one occasion urea was added to the bath to retard the rate of urea removal, resulting in a 15 mg./100 ml. increase. The situation occurred in a patient who developed seizures following an initial dialysis during which the BUN fell from 200 to 86 mg./100 ml. A second dialysis was required within 24 hours because of recurrent hyperkalemia. Urea was added to the bath to prevent the likelihood of further neurologic manifestations of dysequilibrium.

There were five instances in which clinical complications were related to dialysis. Two were neurologic with one patient having recurrent seizures, the other progressive lethargy and somnolence. Both were transient and probably resulted from too vigorous dialysis. Fever occurred twice. Once it was thought to be a reaction to blood used in coil priming. On the other occasion, a fever spike with parasitemia developed in the patient with falciparum malaria. This occurred

Table VIII

DAILY INCREMENTS IN BLOOD UREA NITROGEN

(mg./100 ml.)

	Mean	Range
Trauma	28	(62-10)
Non-trauma	12	(31- 4)
Febrile	25	(62-11)
Afebrile	16	(30- 4)

Table IX

MODALITIES OF MANAGEMENT

	No. of patients
Dialysis	17
Hemodialysis	12
Peritoneal dialysis	5
Conservative (No dialysis)	7
	No. of Dialyses
Hemodialysis	49
No. per pt. (average)	4
Peritoneal Dialysis	6

Table X

LABORATORY VALUES

Test	PRE-DIALYSIS		POST-DIALYSIS	
	Mean	Range	Mean	Range
BUN (mg./100ml.)	119	208-15	77	140-15
Na (mEq./L.)	133	141-110	138	149-128
K (mEq./L.)	5.7	8.5-3.1	4.0	6.7-2.7
Cl (mEq./L.)	88	106-64	95	106-75
HCO_3 (mEq./L.)	22	36-6	19	24-14
Ca (mg./100ml.)	6.2	10.0-4.1	8.0	9.6-7.0
BUN (mg./100ml.)	/dialysis		-52	-114 to +15
Wt. (kg.)	/dialysis		-2.0	-4.2 to +0.7

after he had become afebrile and had had negative malaria smears for three days. It was conjectured that the parasitemia was related to the rate of quinine removal with dialysis. Gastrointestinal hemorrhage from unrecognized duodenal ulcers began at the termination of a dialysis run, in one patient. His coagulation parameters were normal at the time bleeding was first noted, but a Lee-White clotting time of 20 minutes had been obtained earlier in the run, following a dose of Heparin.

Clinical Complications

The major clinical complications for all patients from the time of initial management at the referring facility until disposition are shown in Table XI. The most frequent problems were related to sepsis and occurred exclusively in the trauma group. Positive blood cultures were obtained in 12 patients with documented septicemia. A single instance of Pseudomonas meningitis was associated with Pseudomonas septicemia. (See Tables XII and XIII for additional data on infectious complications.) Other relatively common problems were gastrointestinal and wound hemorrhage, encephalopathies due to metabolic abnormalities, and the "wet lung syndrome"—a poorly understood disorder of pulmonary fluid extravasation occurring in the post-trauma setting. Severe metabolic acidosis with a large anion gap developed in three patients.

Table XI

CLINICAL COMPLICATIONS

Sepsis	51
Wound Infections	16
Septicemia	12
Pneumonia	7
Peritonitis	6
Abscesses	6
Urinary Infections	3
Meningitis	1
Gastrointestinal hemorrhage	5
Encephalopathies	5
Wet Lung Syndrome	5
Acidosis	3
Arrhythmias	1
Hemopneumothorax	1
Atelectasis	1

Table XII

INFECTIOUS COMPLICATIONS

Time of Onset

Site	No. of Patients	
	Present on Admission	Unit Acquired
Wound infections	13	3
Pneumonia	5	2
Septicemia	7	5
Peritonitis	5	1
Abscesses	4	2
Urinary infections	2	1
Meningitis	1	0

The onset was acute in each instance and at a time when uremia and acid-base balance appeared to be well controlled with dialysis. Twice an underlying factor of sudden extreme hypoxia was noted, but the onset appeared to be spontaneous in the third instance. Though pyruvate-lactate levels were not measured, it was assumed that lactic acid was the major contributor in the absence of other causes for the acidosis. The lack of renal tubular capacity to respond to the acid load no doubt added to the severity of the complication. Improvement was achieved in one instance with sodium bicarbonate and alleviation of the hypoxia. In the other two cases, only partial and intermittent correction was possible despite similar treatment plus dialysis. Digitalis toxicity manifested by paroxysmal atrial tachycardia with variable atrio-ventricular block occurred on one occasion associated with hypokalemia. A large hemopneumothorax following thoracentesis, and massive postoperative atelectasis of one lung following laparotomy, occurred in two patients respectively.

Infectious complications were analyzed to determine whether these were present on admission or acquired thereafter, in order to (1) evaluate the unit's

Table XIII

INFECTIOUS COMPLICATIONS

CULTURE DATA

	Staph. aur. (coag. +)	Prot. (indole-)	Prot. (indole+)	E. coli	Ps. A	K-E	M-H	A. faec.	Cand
I. Admission									
Total	1	5	7	12	27	17	4		
Wounds	1	4	6	8	14	11	2		
Sputum		1	1	3	4	3	2		
Blood				1	6	3			
Urine					2				
Sp. Fluid					1				
II. Unit Acquired									
Total	1	2	2	3	4	6	4	1	1
Wounds		1	1	1	2		1		
Sputum	1		1	1	1	3	2	1	
Blood		1		1		3			
Urine					1		1		1
Sp. Fluid									

contribution to infectious complications and (2) to determine the association between sepsis and the occurrence of renal failure. Infections were considered nosocomial with respect to the dialysis unit if they were either not present on admission, or if alteration in the dominant pathogen cultured from a septic site on admission, was demonstrated. The majority of wound infections and most instances of pneumonia and peritonitis were present at the time of admission. Though septicemia, focal abscess formation and urinary tract infections were more often present when the patient was received in transfer, the difference was somewhat less impressive. The single case of meningitis had developed prior to the time of admission. Though no causal relationship between sepsis and acute renal failure can be derived from these data, there exists a strong association between the two entities (Table XII).

Table XIII gives a breakdown of bacterial growth cultured from various sites on admission and regularly thereafter. Organisms were considered dialysis-unit acquired if a new dominant organism appeared, or if the site was originally sterile or showed normal flora. Polymicrobial infection of all sites except the blood and urine was the rule; however, on three occasions even blood cultures were simultaneously positive for two organisms. The data show that all cultures—whether positive at admission or after hospitalization in the unit—grew out gram-negative organisms in all but four instances. Again, regardless of origin, Pseudomonas aeruginosa, Klebsiella-Enterobacter and E. coli were the most common bacteria. Proteus was the next most frequent isolate in both groups. Alcaligenes faecalis and Mima-Herellea were never cultured as the predominant or sole organism and were of questionable significance. Staphylococcus aureus was the principal bacterium in one instance of pneumonia and was grown from a biliary drain on another occasion. The sole case of Candida septicemia occurred in a patient with a polyethylene central venous pressure catheter—the tip of which was also found positive for the organism on culture.

Patient Survival

Of the 24 patients referred to the dialysis unit, seven survived, 15 expired while in the unit, and two others died subsequently in PACOM facilities following their initial dialysis therapy aboard the SANCTUARY. Of the seven survivors, six regained normal renal function as determined by BUN, serum creatinine, creatinine clearance, urine concentrating and diluting ability, and urinalysis studies. The seventh patient with acute glomerulonephritis attained partial return of renal function with a creatinine clearance of 30 cc/min. at the time of discharge, one month post dialysis.

When the survival figures are analyzed on the basis of modality of therapy and type of antecedent illness, the results shown in Tables XIV and XV are obtained. Of seven patients who did not receive dialysis therapy, four died. Three of the expired patients did not require dialysis at the time of death and one patient expired prior to its institution. Of the 17 dialyzed patients, four survived and 13 died—11 while in the dialysis unit and two following transfer. Four of the five patients in the nontrauma group survived. In the trauma group there were three survivors out of 19 patients.

The causes of death are listed in Table XVI. Sepsis—subdivided into gram-negative bacteremia with septic shock, pneumonia and generalized peritonitis—was considered the direct cause of death in 11 patients. Infectious processes were a major contributor to demise in an additional four patients. The remaining deaths were due to wet lung syndrome, cerebral edema in a postcraniotomy patient, gastrointestinal hemorrhage and acute hemorrhagic pancreatitis.

Comments

Acute renal failure constitutes a complex management problem regardless of its etiology and clinical antecedents. In the setting of massive trauma and sepsis, the therapeutic problems are compounded by the necessity for simultaneous treatment of related diseases in addition to the kidney shutdown. Nearly all

Table XIV

SURVIVAL - MODALITY OF THERAPY

	No. of Patients	
Conservative Therapy		7
Survived	3	
Expired	4	
Dialysis Therapy		17
Survived	4	
Expired	11	
Transferred, subsequently expired	2	

Table XV

SURVIVAL — ANTECEDENT ILLNESS

Trauma		**19**
Survived	3	
Expired	14	
Transferred, subsequently expired	2	
Non-trauma		**5**
Survived	4	
Expired	1	

Table XVI

CAUSES OF DEATH

Septic shock	8
Pneumonia	2
"Wet lung" syndrome	3
Peritonitis — GI infarction	1
Cerebral edema — medullary compression	1
GI hemorrhage	1
Pancreatitis	1

of the patients treated in this series were suffering from a multiplicity of traumatic injuries. Though extremity wounds were the most frequent, they were often relatively minor in nature. Thoracico-abdominal injuries, and particularly bowel injuries, seemed to be the most devastating in terms of patient mortality; they were frequently associated with sepsis and poor wound healing, and necessitated prolonged parenteral feeding.

The etiology of acute renal failure in the trauma group appears to involve a combination of a clinical factors. Two thirds of the group had documented hypotension prior to the onset of renal failure. Nearly all cases received blood transfusions, but without known reactions. Sepsis was an early complication in these patients; however, except in those with septic shock, it was difficult to determine the exact onset of sepsis and its temporal relationship to the kidney shutdown. There were no instances of overt myoglobinuria or hemoglobinuria; urinary tests for these substances were all negative on admission to the unit. Contrariwise, the causal factors in the nontrauma group were more readily explicable and intimately related to the basic disease process as an accepted complication.

Oliguria was a manifestation of renal failure in nearly all patients; but three had urine volumes exceeding a liter per day while there was progressive rise in the BUN and serum potassium. All cases of "high-output" renal failure occurred in individuals with bilateral amputations of the lower extremities and in highly catabolic states. The urine was characterized by low overall solute excretion and a relatively high rate of free water clearance. The urine volume could be further increased with diuretic agents, but there was little effect on solute excretion.

In general, the data from the present experience would indicate that attempts at diuresis with either plasma expanders or diuretics are of little value when there is good clinical and laboratory evidence that oliguria is due to acute tubular injury. Often the immediate critical problem at the time of admission was overhydration, resulting from unsuccessful fluid trials to "flush the kidney".

The treatment of acute renal failure, as an isolated aspect of the total disease process, is considered to have been successful in that none of the patients expired as a direct result of a renal-metabolic complication. This is not to say, however, that further improvement in dialysis techniques and metabolic management could not provide further benefit in treating the basic disease and its complications. Though controlled studies are lacking, it would appear that patients tend to feel better and recover more often with early and frequent dialysis designed to restore approximate biochemical normalcy. The survival data fail to indicate that early dialysis significantly altered the ultimate outcome, but the time from onset of renal failure to death was possibly somewhat longer in those who expired.

A disappointing observation was that vigorous ultrafiltration with several kilograms of fluid removal was not beneficial in reversing the "wet lung" process once it was established. Interstitial and alveolar edema fluid seemed to remain fixed regardless of weight loss or the addition of mannitol or albumin to the patient's vascular volume.

Technical difficulties encountered were mainly those of hypotension both in the early and late phases of dialysis, the finding of adequate shunt sites in those with multiple extremity injuries, and, occasional clotting of the coil or venous tubing when attempting to

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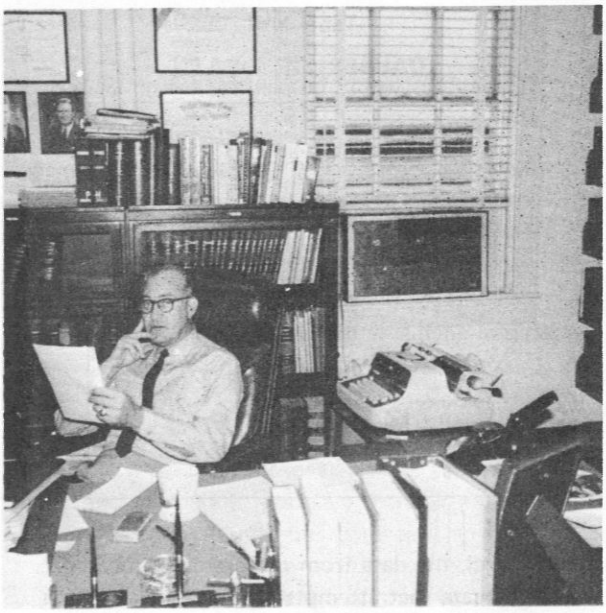

LEGAL BRIEFS

By CAPT Richard E. Blair, JAGC, USN, Legal Assistant to the Surgeon General, Code 11, BUMED.

LIABILITY IN PRESCRIBING "THE PILL"

Although the complete score isn't in for 1970, evidence at hand indicates over 300 suits were filed during 1970 based upon claims of injury flowing from the use of oral contraceptives. With this track record established it is quite apparent many additional suits will be filed in the future.

While the Navy physician is insulated from suit because of his coverage under the Federal Tort Claims Act, we do run the risk of suits being filed against the United States Government under the same theory that is currently being utilized in civilian jurisdictions. It would therefore appear proper for Navy physicians engaged in the practice of gynecology to discuss carefully with each patient the possible hazards in using "The Pill" and alternative methods of contraception, making sure the patient understands these hazards and alternate procedures before prescribing the pill. Thereafter, the substance of the conversation with the patient should be entered in the patient's record.

The reports do not indicate that any physician has been joined with the manufacturer in suits filed up to this time. The actions were brought on the grounds of negligence, breach of warranty, and strict liability against the manufacturer of the contraceptive; but some authorities in the field opine that physicians will be joined with the manufacturer in cases yet to come to trial. It therefore seems reasonable to conclude, if this is the thinking, that we can anticipate some suits being filed in which the government will be a party defendant. If this does occur, the underpinnings of a suit involving the United States Government would be predicated upon the failure of the physician adequately to advise the patient of the possible risk involved in utilization of the contraceptive.

For this reason it is necessary that steps be now taken to assure as full a disclosure of possible side effects to the patient as is consistent with sound medical practice. First, the physician should carefully explore with the patient her entire history in order to determine if "The Pill" is contraindicated. He should then discuss with the patient the benefits of this contraceptive, the calculated risks involved and the alternative methods of contraception, fairly leaving the final determination of whether to use the oral contraceptive or not, to the individual patient. The fact that the risks and alternative methods of contraception were discussed with the patient, and that the decision to use the pill was her own, should be noted in the patient's medical record, assuming of course that the particular patient is one, in the judgment of the physician, for whom oral contraceptives may be properly prescribed. This procedure should satisfy the requirement of full disclosure to the patient and, hopefully, reduce the possibility of any litigation predicated on a lack thereof.

NAVY RESIDENTS' LIABILITY

Inquiries have recently been received in BUMED concerning the protection afforded residents who are physicians on active duty in the Medical Corps of the United States Navy, undergoing all or part of their residency training at civilian teaching institutions, in

the event they should become subject to suit for alleged malpractice in the course of their training activity. The question usually first arises when the receiving institution's counsel or insurance carrier proffers the advice that such individuals are not covered by the existing insurance coverage, and the matter develops into one of extreme concern when the insurance carrier advises that there has been no actuarial experience with Navy residents, indicating a reluctance or outright refusal to include them under extant policies of insurance.

At the outset it should be noted that there is no valid reason to distinguish between residents wearing a Navy uniform and those from civilian institutions so far as liability is concerned. There may be, and undoubtedly is, a difference in competency from individual to individual in any training program, but to attempt to impose a further distinction because of military status of the individual is without factual support. In cases in which the issue has been raised, it has been finally determined to be of no significance.

A naval officer physician on active duty performing his duties in a naval facility is under the protective coverage of the Federal Tort Claims Act (10 U.S.C. § 1346, *et. seq.*, hereinafter referred to as the "Act") so long as he is acting within the scope of his employment (line of duty). Any suit filed against the United States as a result of his alleged negligence in the course thereof will be defended by the United States, and any judgment rendered, paid by the government. Heretofore it had been thought that once he left the Navy facility and entered a civilian facility in a training status, wherein his activities became subject to the direction and control of the civilian institution's staff, his activities were beyond the coverage of the Act. It was therefore reasoned that if, during the course of his training, he should be accused of negligently performing some act resulting in injury to the patient, he would be held personally liable for the wrong unless he were under the protective coverage of professional liability insurance, provided either by himself or the receiving institution.

Very recent developments indicate that the Act's coverage follows him into his civilian residency. In a recent case in which a Public Health Service physician was accused of negligence while performing in a civilian hospital, the Department of Justice viewed his performance as coming within the "scope of employment" and is undertaking defense of the action.

This legal position is highly significant. Under this view, the suit could be brought against the United States because a resident performing in a training status will be considered to be acting within the scope of his employment and entitled to protection of the Act. Any judgment rendered against the United States under these circumstances would be paid by the government. To those who are entitled to sue the United States for any negligence causing injury to a patient, the Navy resident is in the same position undergoing residency training in the civilian facility as he would be if he were performing in a naval hospital under the control of the Medical Department of the Navy. Under extant decisional law, of course, a service member is barred from suing the United States or another member in uniform, for any wrong committed against him by the latter, so long as the actor is performing within the line of duty.

This, of course, does not mean the physician cannot be sued by the patient in a state court, nor does it mean that if he is so sued and a judgment obtained against him, the government will satisfy it. Nor does it offer any immunity to the receiving hospital in the event the plaintiff decides to join it as a defendant. If such action were taken against the physician and the plaintiff were successful, the Chief, Bureau of Medicine and Surgery, would exert every effort to obtain private relief through the Congress. For such reassurance as it may provide, there is no record of any successfully prosecuted case against a military physician that resulted in a personal judgment against him.

The military physician is now the only government physician who stands in such jeopardy. For several years Veterans Administration physicians, and since the dying days of the 91st Congress the Public Health Service physicians, have been personally immune from suit because the remedy of the plaintiff lies solely in an action against the United States under the Act. A bill providing the same protection for military physicians was introduced by Senator Tydings in July 1970, but died with the adjournment of the 91st Congress. It is hoped such protection will be extended to military physicians by the present Congress. (See U.S. Navy Medicine 56: 3, Sept. 1970, p. 39.)

In the meantime, the question is how to protect the Navy's medical residents from personal liability while undergoing training at a civilian hospital, without making it necessary to procure private insurance coverage. The only solution at the moment is for the sending naval hospital to work with the receiving civilian hospital in making satisfactory arrangements with the receiving hospital's insurance carrier to include the Navy residents under the hospital's insurance coverage. In those instances where an increased premium rate may result, the increase in cost should be charged back to the sending naval hospital as a part of the cost of providing the Navy residents' training. It may be argued

that this represents a radical departure from past practice, and may perhaps be illegal, since there is no provision in current law for using appropriated funds to pay insurance premiums. However, there is a vast difference in direct payment of insurance premiums and their inclusion in the costs of a training program involving a civilian hospital. The receiving hospital's cost of doing business is increased by the amount of the premium charged to include Navy residents under its insurance coverage; such a cost is as legitimate as would be the cost of additional space or equipment to accommodate the residents' requirements.

It is therefore suggested that commanding officers of naval hospitals resolve such problems as they arise, along these lines, by working with their judge advocates. The Surgeon General would like to be kept abreast of any plans finalized and the additional costs, if any, which may be incurred in this connection.

(Continued from p. 45)
keep the degree of anticoagulation at a minimum. None of these constituted an insurmountable problem and both standard and innovative measures could be applied to alleviate them. Whether regional heparinization should have been used more frequently in the trauma patients is uncertain. Bleeding was not an overall significant problem; however, in one patient with multiple unsuspected duodenal ulcers, who bled massively following dialysis, hemorrhage was the direct cause of death.

The major clinical problem and primary prognostic indicator was the presence of sepsis. It was extremely difficult to reverse the process, and once septicemia, severe pneumonitis, peritonitis or progressive wound infection developed, there seemed to be little of therapeutic benefit available. No doubt the frequency of resistant gram-negative organisms was a significant factor. The disc sensitivity studies performed on initial cultures suggested that the Pseudomonas, Klebsiella-Enterobacter, E. coli and Proteus bacteria should have responded to the appropriate antibiotics—gentamicin, kanamycin, chloramphenicol, ampicillin and cephalothin being the major ones. Appropriate adjustments in dosage both for dialysis and decreased renal function were made. Whether adequate blood levels were being attained is not certain, since methods for their measurement were not available. An additional possibility may be that more vigorous and early surgical débridement, drainage and amputation should be carried out, in view of the overall disappointing results in cases presenting infectious complications.

Overall survival of this group of patients was 29% with all but one of the deaths occurring in the trauma group. It is evident from this experience that the prognosis for patients with acute renal failure depends upon the severity of the underlying trauma or illness and its complications. Though the metabolic consequences of kidney shutdown could be controlled, the mortality rate was not appreciably less than that noted with predialysis methods of management. Improved survival rates will have to await improved management of the basic injuries and prevention of septic complications.

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calendar year 1970, SANCTUARY admitted a total of 6,354 patients and served 10,751 outpatients (12,971 in 1969).

But how has the medical officer fared in the course of these 100 years? As an integral part of the Navy Medical Corps, physician and naval devotee, has the *man* changed?

His life is certainly different. Medical education takes longer, and costs much more. He has faced unprecedented competition to gain the privilege of entering medical school. His studies are more complex, and more stringent academic requirements are imposed. An accelerated rate of scientific advances has heightened the need for continuous study and increased proficiency. He is thereby propelled in the direction of specialization, in seeming disparity with the rate of social development. While he can avail himself of more efficient forms of transportation and communication, he is obliged to travel faster and further, to read more, to write more and converse more – much, much more.

While enabled to exert far greater influence on the length and quality of life, he is troubled by the existing limitations. Legal, social and religious concepts of life, death and humane license confront him. He struggles to reconcile social requirements with professional ethics and personal convictions, without compromise of integrity.

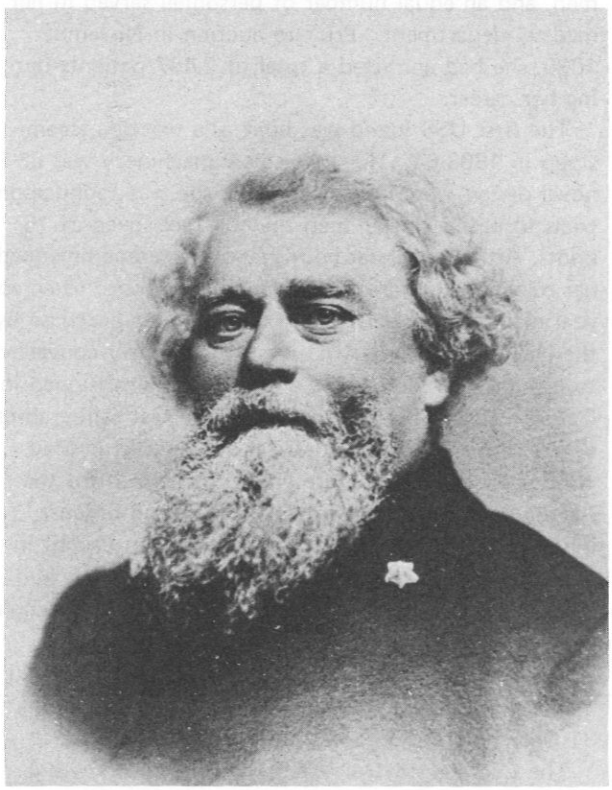
He is highly compassionate but this is seldom recognized as modern social and technologic requirements forcibly interpose more people and things between him and his patient. Though he may be criticized more, he has never been in greater demand. If there is anything about the *man* that remains basically unaltered, it is perhaps what is on his mind, and in his heart.

A 1971 VIEW of THE MEDICAL CORPS CIRCA 1871

On 3 March 1871 the Forty-First Congress enacted the Appropriations Act which established the Medical Corps as a separate entity and as a Staff Corps of the U.S. Navy. The Act also provided that the Chief of the Bureau of Medicine and Surgery would have the title of Surgeon General and the relative rank of Commodore.

The first issue of any "Register" to list a "Medical Corps" and "Surgeon General" for the U.S. Navy was issued by the Government Printing Office in 1871. In the 1871 "Register" the names, ranks, home states and duty stations of 153 medical officers were listed, in addition to the Surgeon General.

Dr. William Maxwell Wood had been appointed an Assistant Surgeon in the Navy on 16 May 1829. His naval duties were varied and related to the events of that period — suppression of piracy, the slave trade, the Seminole War, the Mexican War, and the Civil War. While serving as Fleet Surgeon under Commodore Sloat, this medical officer was given permission to return to the U.S., at his own expense, in April 1846. For the Pacific Commander-in-Chief, Commodore Sloat, Dr. Wood was the bearer of a letter and sensitive verbal information concerning the military — political situation, for delivery to the Hon. George Bancroft, then SECNAV. Surgeon Wood traveled across Mexico making his way from San Blas to Veracruz. At Guadalajara he noted a significant force of British ships at anchor off the port. Through his own intelligence activity he



Commodore William M. Wood, MC, USN. Fifth Chief of BUMED and the first Surgeon General.

Commodore Jonathan M. Foltz, MC, USN. Sixth Chief of BUMED who assumed the title and position of Surgeon General on 25 October 1871.

learned of a successful attack upon the American forces on the Rio Grande — the opening of the Mexican War. Appreciating the impact of these events, he secured a courier to deliver a written report to his Commander-in-Chief in the Pacific. Acting upon the intelligence provided him by Dr. Wood, Commodore Sloat sailed immediately for California, arriving at Monterey on 7 July 1846, and taking formal possession of California. Dr. Wood was warmly commended by the Commodore and the Chairman of the Naval Committee of the U.S. Senate for his bold and prudent action that led to the rapid acquisition of California by the U.S., before the British had time to act.

Under Surgeon General Wood, three particular events of special importance took place:

(1) Enactment of law whereby future medical officers were to be grouped in a separate and distinct staff corps with grades established by law;

(2) Building of the Naval Hospital at Mare Island, California, and;

(3) Passage of the Naval Appropriations Act of 3 March 1871, by which the chief of the Bureau of Medicine and Surgery was given the title of Surgeon General and the rank of Commodore.

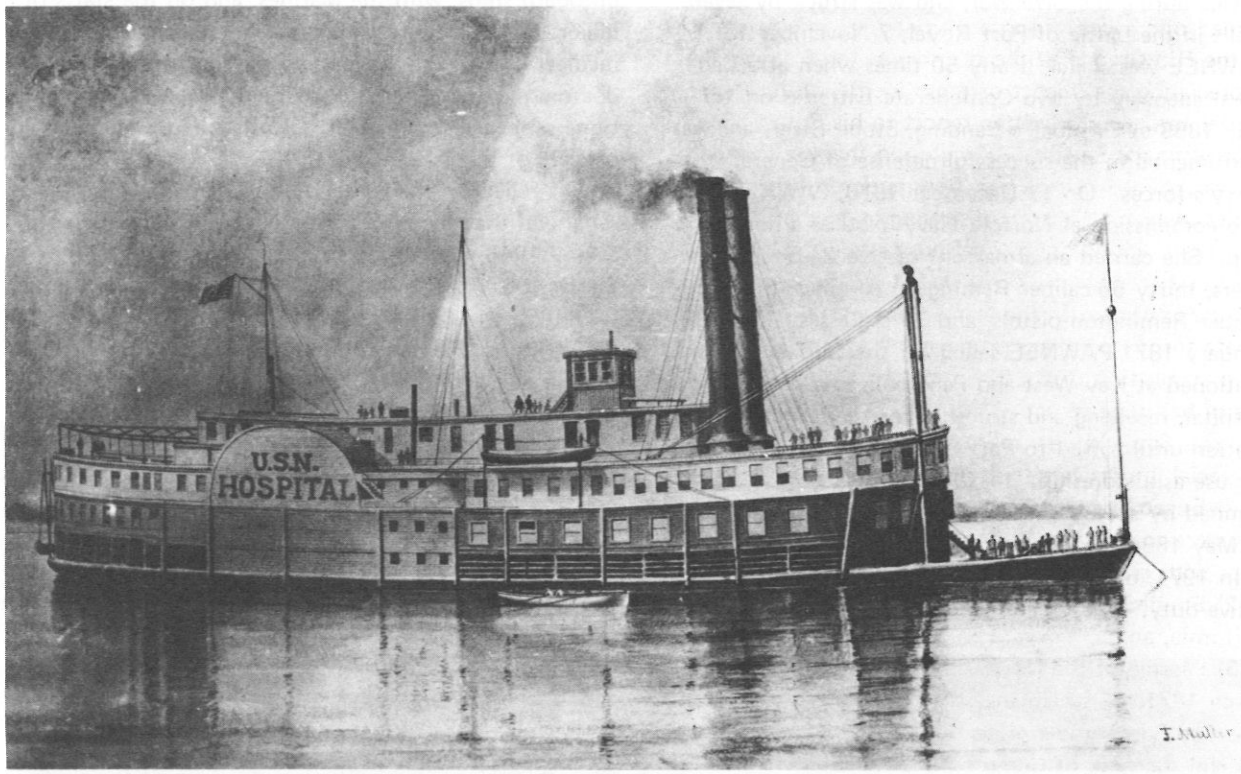
Dr. Jonathan Messersmith Foltz was born in Lancaster, Pa., on 25 April 1810. He studied medicine under a preceptor and at Jefferson Medical College in Philadelphia. On 4 April 1830, he was commissioned an Assistant Surgeon in the Navy by President Andrew Jackson. Dr. Foltz participated in the famous battle of Quallah Batoo (1832) on the coast of Sumatra, and received high praise from Admiral Farragut for ability, courage and devoted service during the Civil War as Fleet Surgeon under Admiral Farragut. Dr. Foltz was a trusted friend and professional advisor to President James Buchanan. Appointed Surgeon General of the Navy in October 1871 by President Grant, Commodore Foltz served until retirement for age, on 25 April 1872. (Statutory retirement age was then 62 years.) He was a learned man in his chosen profession, and possessed superior administrative talents. By his own personal tribute to the sailor, Dr. Foltz revealed a celebrated quality in himself: "The sailor's greatest ambition is to do his duty. May I ever do mine."

As of 3 March 1871, naval hospitals were established at Chelsea, Boston, Mass.; Brooklyn, N.Y.; Philadelphia, Pa.; Washington, D.C.; Annapolis, Md.; Norfolk, Va.; Pensacola, Fla., and; Mare Island, Calif. The USS Red Rover, the first vessel officially commissioned as a hospital ship by the U.S. Navy, had been sold at public auction in November 1865. The hospital ship, USS Pawnee was at anchor at Key West, Fla. The first USS Idaho, the only ship with this name to serve as a hospital ship, was tied up at Yokohama, Japan, as a temporary yellow fever hospital. (She established the U.S. Naval Hospital at Yokohama in 1872, and continued to serve as a hospital ship until 1874, when she was sold to the East Indies Trading Company for $18,624.05.) Although decommissioned in 1863, the first USS Relief, classified as a medical storeship vice hospital ship, was still serving as the Receiving Ship at Washington, D.C.

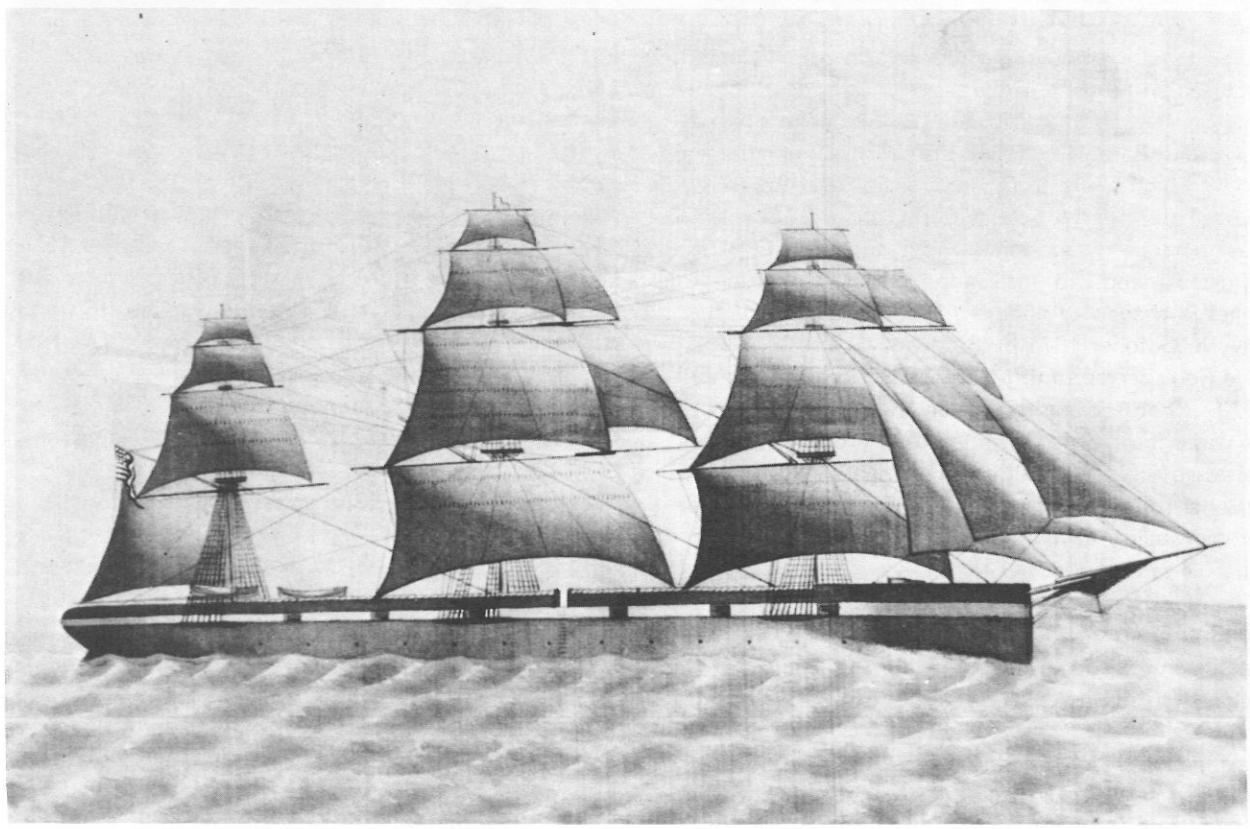
The USS Red Rover was a wooden side-wheel steamer displacing 786 tons and drawing eight feet of water; she consumed 37½ bushels of coal per hour and had a maximum upstream speed of nine knots. The ship had been captured from the Confederate States Navy in April 1862. She was repaired and fitted out in the next few weeks as a floating hospital to support the Union Navy's Western Flotilla. RED ROVER boasted an ice box with a 300 ton capacity, bathrooms, laundry, elevator for the sick from the lower to the upper deck, amputation room, nine different waterclosets, gauze blinds over windows to keep out cinders and smoke, and a regular corps of nurses. She was active during the siege of Vicksburg and related operations. Following repairs in early 1864, she participated in patrols of the Mississippi and received patients from ships for removal to shore hospitals. Her crew averaged 40 men, and an equal number of personnel served in her medical department. Prior to auction in November 1865, she had admitted a total of 2,497 patients during her career.

The first USS Idaho was built as a wooden steam sloop in 1863-64. Her twin-screw machinery was of novel design. Completed in 1866, she was found upon trials to be far slower than the contract speed of 15 knots. Although a board of naval officers recommended her rejection, Congress intervened in response to an appeal made by the designer. Following her purchase by the Navy in 1867, IDAHO was subsequently converted to a full-rigged sailing ship and was recommissioned in October 1867. She was one of the fastest sailing ships of her day and following arrival at Nagasaki in May 1868, she served as a store and hospital ship for the Asiatic Squadron. In September 1869 she began a long voyage back to the U.S. but was soon caught in a raging typhoon. Her masts torn away and her hull severely damaged, she remained afloat and was brought back to Yokohama by her crew. Unfit for further cruising, IDAHO served as a hospital ship at Nagasaki, Yokosuka and Yokohama until her decommissioning 31 December 1873.

The USS Pawnee (pictured on front cover) was a steamer launched in October 1859 and placed in commission 11 June 1860. She had an excellent combat



USS Red Rover



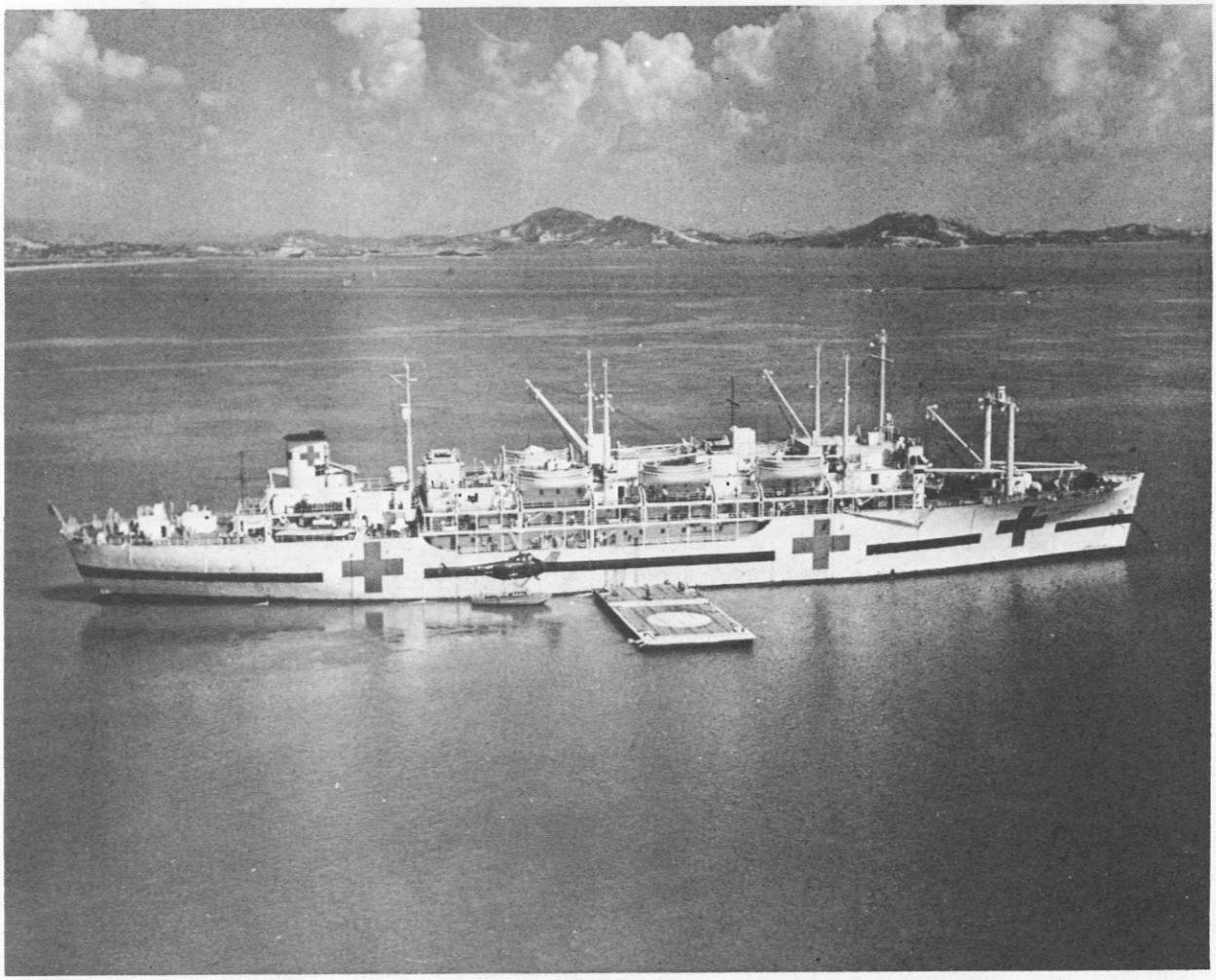
USS Idaho

service during the Civil War, and was struck by seven shells in the battle of Port Royal, 7 November 1861. PAWNEE was struck nearly 50 times when attacked simultaneously by two Confederate batteries on 16 July 1863 at Grimball's Landing, Stone River, and was instrumental in the successful defense of General Terry's forces. On 17 December 1870, PAWNEE went into commission at Norfolk Navy Yard as a hospital ship. She carried an armament of two 24-pound howitzers, thirty 50-caliber Remington carbines, thirty 50-caliber Remington pistols, and 30 cutlasses. On 7 January 1871 PAWNEE sailed for the Gulf of Mexico. Stationed at Key West and Pensacola, she served as a hospital, receiving and storeship for the North Atlantic Station until towed to Port Royal, S.C., in April 1875 for use as a storeship. In 1883 PAWNEE was condemned by survey and stricken from the Navy Register. In May 1884 the ship was sold for $6,011.

In 1971, over 4,000 Navy medical officers are on active duty. They serve at naval hospitals, dispensaries, on board ships, with the Marines, and on the staffs of major fleet and force commanders. Responsible for the medical care of more than two million people, Navy doctors may be generally classified as general practitioners, specialists, research scientists and commanding officers of medical facilities.

While viewing the status of things in 1871, we are reminded that the USS Haven (AH-12), commissioned 5 May 1945, was struck from the Navy List on 1 March 1967. After serving briefly in the Pacific during World War II, she also received nine battle stars for service in the Korean conflict. Following decommissioning at Long Beach, 30 June 1957, she remained there to provide medical services in an "In Reserve, In Service" status until 1967. She was subsequently sold to Union Carbide Corp. and converted to an Ocean Chemical Tankship.

USS Repose (AH-16) was commissioned on 26 May 1945 and was first decommissioned December 21, 1954 at Hunter's Point Naval Shipyard, following extensive



USS Haven (AH-12) in October 1952

USS Repose (AH-16)

service during the Korean conflict. She returned to commissioned service on 16 October 1965 and arrived off Chu Lai, RVN on 14 February 1966. Responsible for the I Corps Tactical Zone from DaNang to the DMZ (17°N), REPOSE was usually underway, seldom departed the combat zone, and received almost all casualties by helicopter. From arrival in 1966 until final departure in March 1970, REPOSE admitted more than 24,000 patients including more than 9,000 battle casualties. She was twice awarded the Navy Unit Commendation. Since decommissioning 15 August 1970, REPOSE has remained at Long Beach, Calif., providing inpatient and outpatient care for active duty and retired male personnel.

USS Sanctuary (AH-17) is proudly pictured on the front cover of this issue. She was converted into a hospital ship and placed in commission 20 June 1945. After sailing approximately 90,000 miles, carrying 1,800 liberated Allied prisoners and 877 patients to the U.S., she entered Philadelphia Naval Shipyard on 1 March 1946 for inactivation overhaul. SANCTUARY was recommissioned 15 November 1966, completely modernized. Her vital statistics follow: length – 520 feet; beam – 71½ feet; draft – 24 feet; displacement – 15,450 tons, and; designed speed – 18 knots. She arrived on station in the South China Sea off DaNang, Vietnam on 10 April 1967 and to this day she steadfastly provides medical support of unsurpassed excellence in the combat area. The Naval Hospital in SANCTUARY averaged a total on board staff of 59 officers, 236 hospital corpsmen and eight dental technicians during calendar year 1970. Included among her many available facilities and capabilities are: arteriography, complete; cardiopulmonary laboratory; artificial kidney; electroencephalography; echoencephalography; pneumoencephalography; optical dispensing; physiotherapy; audiometry; hyperbaric chamber; artificial heart pump and blood oxygenator; ultrasonic diagnostic equipment; blood bank which preserves frozen blood indefinitely, and; heliport. During the

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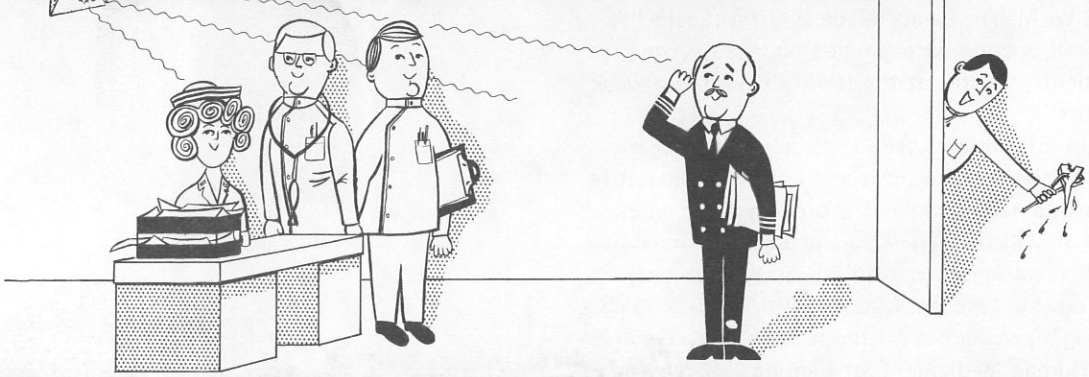
Notes and Announcements



HEALTH STUDY REPORT SUGGESTS

CORPSMEN TO SUB FOR DOCTORS

A preliminary report on a Defense study of military health care says it includes a suggestion to reduce the need for physicians, dentists and nurses by using highly-trained corpsmen as doctor assistants.

The study, completed in November and scheduled to be made available in January, also suggests:

Light care, self-help beds;

Increased automation in laboratory and radiology departments; and

Convenience food systems.

The study reports a 10% reduction in operating costs might be realized by the Defense Department if it adopts the recommendations.

Defense officials also said recommendations for automation and light care beds will be tested in existing hospitals. Other recommendations are to be included in long range plans for the construction of a prototype hospital for "a new generation of military hospitals for the late 1970s."

The study was conducted by Westinghouse Electric Corporation and Arthur D. Little, Incorporated. The companies analyzed selected military hospitals, outpatient clinics and dispensaries to determine what procedures might lead to significant improvements in DoD hospital design, staff assignments and operating costs. — Washington (AFPS).

FORMULARY NOTES

Chloramphenicol

The Armed Forces Medical Departments acting through the Defense Medical Materiel Board, have recently evaluated the central procurement of chloramphenicol products. A very small percentage of total procurement has been for use of and for our own personnel. Most purchases were for direct issue to foreign military customers or to another government agency.

Consumption of chloramphenicol products by U.S. Forces alone is inadequate to justify the expense and effort of central procurement and distribution. Consequently, standard stock chloramphenicol products have been reclassified to limited standard. They will continue to be issued until existing stocks are attrited, but there will be no further central purchases. When system inventories have been purged, local requirements may be purchased on the open market in the limited quantities necessary.—Code 4A, BUMED.

MINI ROUNDS

Outpatient record filing for dependents at naval hospitals and dispensaries is now done by numbers instead of names. The sponsor's Social Security Number is used for terminal digit — numerical filing. (Military records will also be filed by Social Security Number by January 1972.)

Congratulations to *CAPT Donald C. Kent, MC, USN,* who was presented the Legion of Merit Award by RADM Horace D. Warden, MC, USN, Commanding Officer Naval Hospital, San Diego, Calif. CAPT Kent was former CO Naval Medical Research Unit No. 3 in Cairo, Egypt until last July. He was commended for the rapid reestablishment of a U.S. Navy medical research unit in the United Arab Republic after the 1967 Middle East crisis and subsequent evacuation of all American staff personnel. The Spanish embassy in Cairo handles U.S. affairs in Egypt, but the PMRU No. 3 was allowed to return to its important work at the invitation of the late President Nasser. The main

target of fruitful study was schistosomiasis.

A new $750,000 *medical-dental facility* was dedicated in November 1970 at *Miramar Naval Air Station.* CAPT R.W. Maher, Senior Medical Officer, said the facility will operate on expanded hours to accommodate patients; doctors at the facility voluntarily work long hours.

The use of a *retired naval medical corpsman as a teacher* of physical diagnosis and as an administrative assistant in a medical school is proving to be an excellent use of skilled military paramedical personnel in the civilian setting, to save physician teacher time. So wrote Tom M. Johnson, M.D. of East Lansing, Mich., describing a program at Michigan State University College of Human Medicine, East Lansing, whereby an ex-hospital corpsman is teaching beginning procedural physical diagnosis to first and second-year medical students. See Letters, JAMA 213:12; Sept. 21, 1970; pp 2080-81.

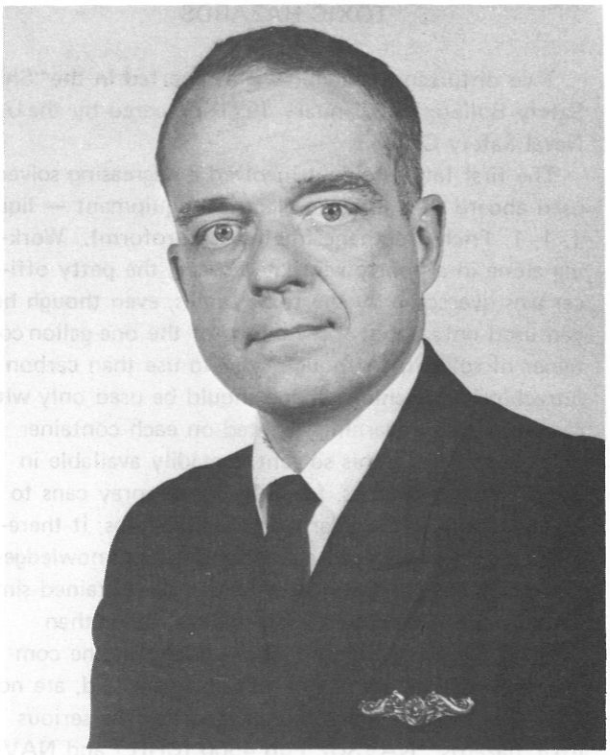
Convening date of CAPT to RADM Staff Active *Selection Boards* has been changed to 20 April 1971 (vice 25 May).

U.S. *Naval Hospital, Naples,* Italy has a new Medical Library dedicated to the memory of the former commanding officer, CAPT Lloyd C. Rohrs, MC, USN (dec).

Starting 1 Jan. 1971, the Federal Insurance Contributions Act *(FICA) rate increased* to 5.2%, with a maximum annual contribution set at $405.60. This amounts to $2.40 monthly increase for those paying the maximum $7,800 payroll tax. The tax is computed only on base pay. FICA tax includes contributions for Social Security and Medicare. Military personnel came under Social Security coverage in Jan. 1957.

CAPT Tor Richter, MC, USN, now Commanding Officer of the Naval Medical Research Institute, NNMC, Bethesda, recently received the Meritorious Service Medal for his work at BUMED from Nov. 1966 to July 1970. As Staff Medical Officer to the Oceanographer of the Navy, and Deep Submergence Biomedical Program Officer to the Surgeon General, he was responsible for formulating, documenting, justifying and managing a comprehensive biomedical program in connection with man's capability to explore ocean depths. An authority on deep-ocean biomedicine, CAPT Richter is often consulted by Navy activities and other federal agencies for expert advice.—PAO, NNMC, Bethesda, Md.

ADM Arleigh Burke, USN, (Ret), former CNO, spoke at the Naval Dental School on 8 Dec. 1970, concerning "The Current International Situation". Retiring in 1961 after 42 years of active service ADM Burke has the distinction of having served as CNO longer than any other officer.—PAO, NNMC, Bethesda, Md.



CAPT Tor Richter, MC, USN

ADM Arleigh Burke, USN, (Ret)

TOXIC HAZARDS

Two disturbing accidents were reported in the "Ships Safety Bulletin" of January 1971, prepared by the U.S. Naval Safety Center.

The first fatal accident involved a degreasing solvent used aboard ship to clean electrical equipment — liquid 1, 1, 1, Trichloroethane (methyl chloroform). Working alone in a poorly ventilated space, the petty officer was overcome by the toxic fumes, even though he had used only about three-tenths of the one-gallon container of solvent. Although safer to use than carbon tetrachloride, trichloroethane should be used only with caution and the warnings printed on each container must be heeded. This solvent is readily available in various size containers, from 12 ounce spray cans to 5 gallon cans, in ServMarts and Swift Shops; it therefore may be introduced aboard ship by unknowledgeable personnel. Additionally, ships have obtained similar solvents from commercial sources rather than through the Navy supply system. Many of the commercial products are not chemically identified, are not labeled with adequate warnings, and may be serious toxic hazards. NAVSUP Pub 4500 (CHIL) and NAVSHIPSTECHMAN Chapter 9600 provide information, guidance and directives on the use and storage of toxic materials.

The second incident involved two men assigned the task of scaling the interior of one of the ship's evaporators, previously cleaned with sulfamic acid.

Both men were provided with coveralls, respirators, flashlights and goggles. They were briefed to wear the protective gear at all times while inside the evaporator. Once inside the evaporator, they removed their masks and goggles due to heat discomfort and reduced visibility. They were inside the evaporator for a total of about 30 minutes in five to ten-minute periods. Approximately one hour later, both men reported to sick bay with eye irritation. Both were hospitalized; one was released 48 hours later while the second man suffered permanent eye injury. Eye irritation was caused by the fumes produced by the reaction of sulfamic acid with the metal and the sea water scale.

This is but one of several reports received at the Naval Safety Center which points up the inherent dangers associated with the chemical cleaning of equipment. In most cases the accidents were caused by not fully complying with the procedures outlined in the NAVSHIPS Technical Manual, Chapter 9580, and the general lack of respect for the unseen dangers present during and after the chemical cleaning.

Complete research, full understanding of the task prior to the chemical cleaning job, proper procedures, adherence to safety precautions, and direct supervision during and after the chemical cleaning can eliminate acid/cleaning accidents.

CDR JEWUSIAK, DR. SPENCE AND CDR SELL AUTHORS OF PRIZE PAPER

On 14 December 1970 the Washington, D.C. Orthopaedic Society held its annual Resident Night. Papers were presented by residents from five different Orthopaedic programs in the area. CDR E.M. Jewusiak, MC, USN, a third-year resident in Orthopaedic Surgery at Naval Hospital, Bethesda, presented a paper entitled "Solitary Benign Enchondroma of Bone: Results of Treatment by Curettage and Packing with Freeze-Dried Cancellous Bone Allograft." This paper was awarded first prize. Coauthors were: Kenneth F. Spence, M.D., and CDR Kenneth W. Sell, MC, USN. An abstract follows.

Twenty-three cases of benign solitary enchondroma of the hand were reviewed. The diagnosis was established by histologic examination and treatment consisted of curettage followed by packing with freeze-dried cancellous bone allograft. All cases healed in three to twelve months. Freeze-dried cancellous bone allograft therefore seemed to be the graft of choice for the treatment of this lesion.

135TH ANNIVERSARY OF NAV HOSP BOSTON, CHELSEA, MASS.

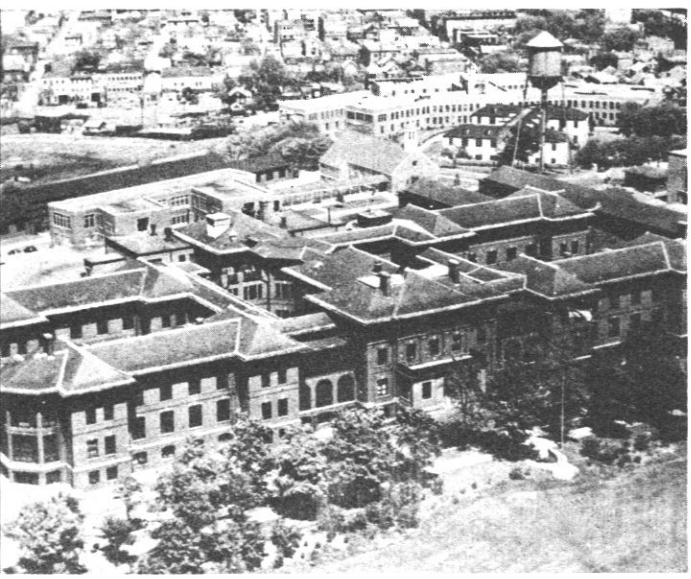
On Thursday, 7 January 1971 the Naval Hospital, Boston, Chelsea, Mass. celebrated the 135th anniversary of its commissioning. The celebration was highlighted by the cake-cutting ceremony executed by CAPT Arthur R. Errion, MC, USN, Commanding Officer, which preceded happy hour at the officers' and enlisted men's clubs.

The history of the hospital dates back to 1823 when the Commission of Naval Hospitals purchased 115 acres of land adjacent to the Mystic River from Aaron Dexter for $18,000. Construction of the hospital commenced in 1832 and was completed in 1836. The hospital was commissioned on 7 January 1836 as the United States Naval Hospital at Chelsea. Vestiges of the first hospital still remain; the original Vermont granite hospital presently serves as the Bachelor Officers' Quarters.

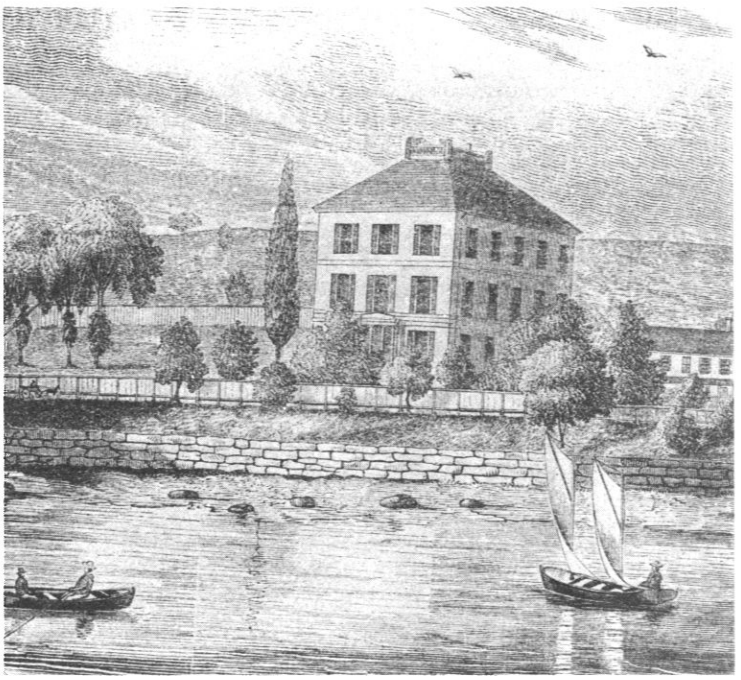
Although the Naval Hospital, Norfolk, is chronologically older than Naval Hospital, Boston, having been commissioned in 1830, its operation was interrupted during the Civil War when it was held by the

Confederacy. Hence, Naval Hospital, Boston, has the distinction of being the oldest naval hospital in continuous operation.—PAO, Nav Hosp Boston, Chelsea, Mass.

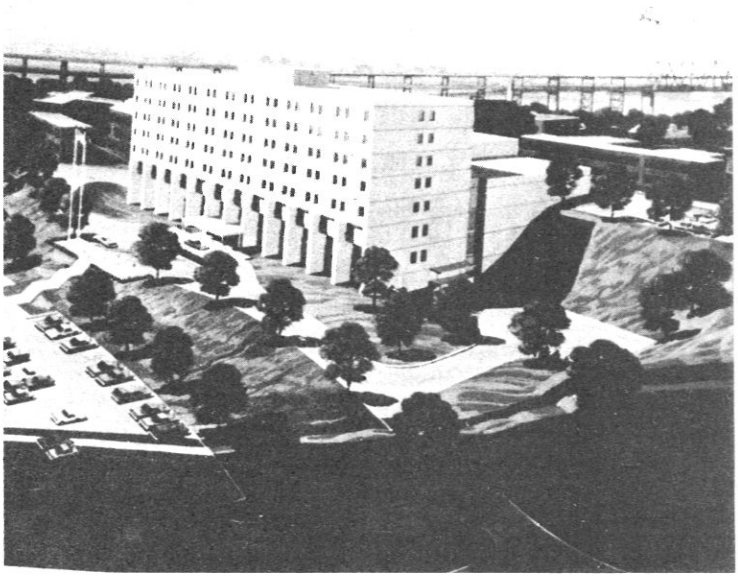
CAPT Arthur R. Errion, MC, USN, Commanding Officer, cuts cake as CAPT Frank L. Mayberry, MSC, USN, Administrative Officer, looks on.



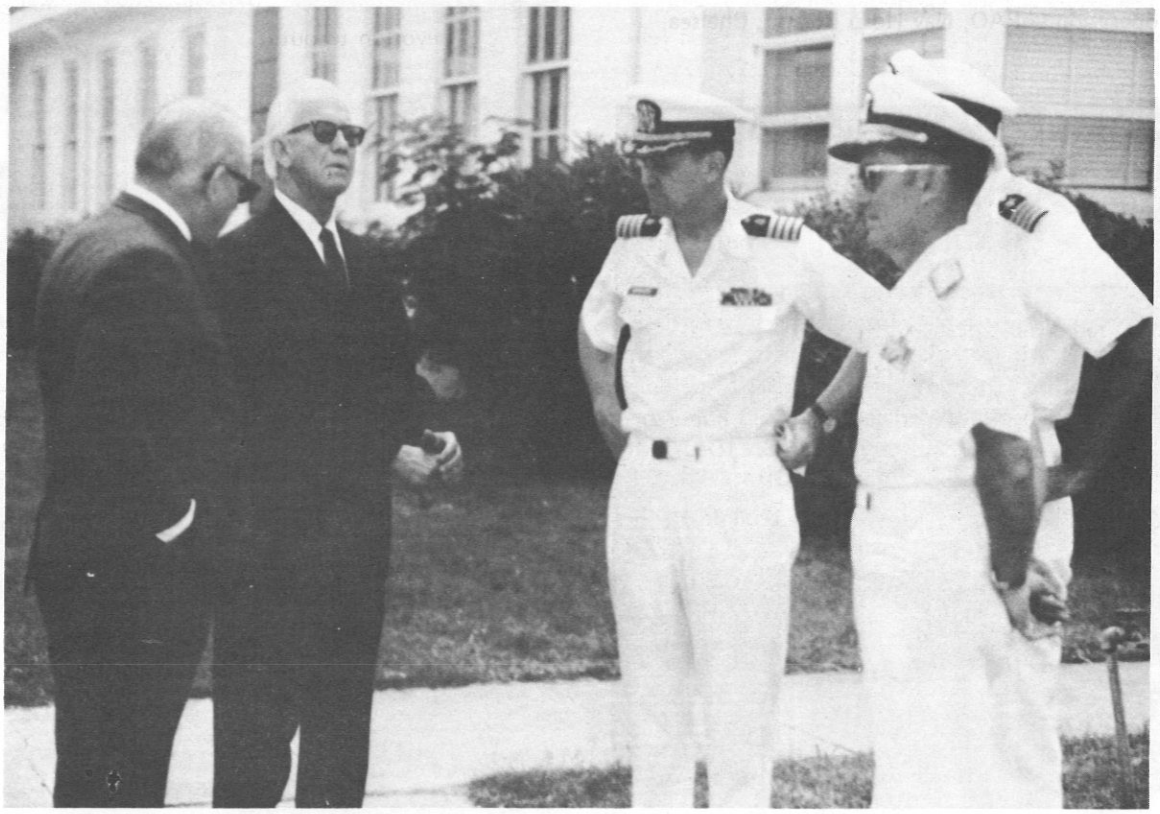
Naval Hospital Boston, Chelsea, Mass. as it appears today.



Sketch of original Naval Hospital at Chelsea, Mass., circa 1850.



Sketch of new hospital planned for future construction at the site of existing hospital.



Two Congressmen visited Naval Hospital, Corpus Christi, Texas in the spring of 1970. Pictured from left to right are: U.S. Representatives John Young (D, Tex.) and the late L. Mendel Rivers (D, S.C.) visiting with CAPT H. A. Baker, Commanding Officer of Naval Hospital; CAPT R. F. Reagan (hidden), Commanding Officer of Naval Air Station; and RADM F. C. Turner, Chief of Naval Air Advanced Training. The group toured the surgery wards and visited with the patients, many of whom were recuperating from wounds received in action in Vietnam. (Courtesy of Naval Medical School, NNMC, Bethesda.)

FIELD MEDICAL SERVICE

SCHOOLS CITED

The following letter of appreciation was received by Commanding Officers of the Field Medical Service Schools at Camp Pendleton, Calif., and Camp Lejeune, N.C. The letter was written by General L.W. Walt, USMC (Ret), former Assistant Commandant of the Marine Corps.

"Upon my retirement from the Marine Corps I wish to express my sincere appreciation for the outstanding support and service rendered to the U.S. Marine Corps by the Field Medical Service Schools.

"The pride, dedication, loyalty, and professionalism displayed by Medical Department personnel on the battlefields of Vietnam were initiated in the training programs at the Field Medical Service Schools and reflect the devotion to duty and professionalism of the staff at these schools.

"The contributions toward the state of training and combat readiness of Navy Medical Department personnel ordered to Fleet Marine Forces in combat operations in the Republic of Vietnam since early 1965 cannot be over estimated. The medical support requirements generated by the landing of the Marines in the Republic of Vietnam demanded a tremendous increase in student input. Since that build-up, and through 1970, the Field Medical Service Schools have trained over 32,000 personnel. This greatly-expanded increase in workload was effectively handled with only a modest increase in assets and without any lowering of training standards. The 'can-do' spirit, typical of the Navy/Marine Corps medical team prevailed throughout this turbulent period notwithstanding the many

pressures confronting the schools.

"The efforts of the Field Medical Service Schools to provide quality trained medical department and religious personnel to the Marine Corps combat team reflect great credit upon the Schools and the entire Naval Service. I am confident in the years ahead they will continue to be responsive to the changing needs of the field and continue their outstanding professional service and devotion to duty.

"I extend to you my personal, 'Well done' and best wishes for continued success."

HOSPITAL LIBRARY GIFT

At a recent ceremony in the Commanding Officer's conference room at Naval Hospital, Boston, Chelsea, Mass., nine staff hospital corpsmen presented the Commanding Officer with three medical texts to be donated to the Hospital's Medical Library in honor of the late CDR Lorraine Murphy, NC, USN (Dec), who had died unexpectedly on 29 July 1970.

All of the corpsmen had an opportunity to work for CDR Murphy when she was Head Nurse of the Sick Officers' Quarters at Naval Hospital, Boston. In response to the respect and admiration they held for her, the corpsmen voluntarily took up a collection among themselves to finance the memoriam. Their efforts resulted in the donation to the medical library of three texts on the treatment and management of cardiac dysfunctions.

In the photograph, from left to right are: CAPT Arthur R. Errion, MC, USN, Commanding Officer Naval Hospital, Boston, accepting the donation of texts for the Medical Library; Mrs. Elizabeth M. Greeley, Medical Librarian; HN Ronald L. Manville; HA Robert P. Murawski; HN Kermit L. Mathiason; HN James E. Davis; HN Kenneth J. Bailey; HM3 Delmar W. Hollon; HM3 Thomas Hasselbacher; and HA Charles S. Thomas. Missing is HN Hugh M. North.—PAO, Nav Hosp Boston.

TO THE DENTAL TECHNICIANS

"On the occasion of the Twenty-third Anniversary of the Dental Technician Rating, I wish to extend my personal congratulations and express my appreciation for the outstanding service you have rendered to the Naval Dental Corps. Your earnest support of dental programs throughout the world has resulted in our Navy and Marine Corps personnel receiving the best dental care possible.

"To you and your families I send my best wishes for continued success and an even brighter future."

E.C. Raffetto
Assistant Chief for Dentistry
and Chief, Dental Division, BUMED.

ANNUAL SPRING SYMPOSIUM

The Boston Naval Hospital Annual Spring Symposium will be held on Thursday and Friday, 13 and 14 May 1971. The Surgeon General of the Navy has given his endorsement to this meeting and an outstanding program is being arranged which will have as its theme "A Forward Look in Medicine". Civilian physicians of prominence from the New England area will participate.

You are urged to make application for presentation of papers. In keeping with the theme of the Symposium, the program will generally include those subjects in clinical medicine, dentistry, nursing and hospital administration which are coming into use at the present time, and appear to have strong potential for future utilization in medicine. Presentations will be limited to 15 minutes with few exceptions. Also, if desired, shorter papers on specific cases or subjects may be submitted.

Abstracts of the paper, in duplicate, along with the title to total no more than 50 words should be submitted immediately to:

CAPT S. G. Kramer, MC, USN
Program Chairman
Naval Hospital Boston
Chelsea, Mass. 02150.

Abstracts should indicate the author's rank, branch of service and assignment. If multiple authors are listed, the presenter of the paper should be identified.

The Symposium is open to officers of all branches of the Armed Services, the Veterans Administration and Public Health Services. Members of the Reserve Corps, National Guard and other interested civilians are invited to participate and are encouraged to attend. A social event for the evening of Friday, 14 May 1971, is planned and will be outlined later.

Make plans to attend and please send your request for a position on the program immediately.

NEW CORRESPONDENCE COURSE ON DIVING

The recently developed correspondence course, "Medical Aspects of Deep and Shallow Water Diving," (NavPers 13113) is now available for enrollment to officers and enlisted personnel on reserve or active duty status within the Navy Medical Department. The course contains four objective-type assignments and is evaluated at eight points for purposes of Naval Reserve Retirement.

Diving is discussed under the following topics: history and development of diving in the U.S. Navy; divers, equipment and communication; aspects of physics, anatomy and physiology; decompression; the dive; safety; and many other items related to the diving function. With the rapidly growing interest in this field, it should prove valuable to all Medical Department personnel. TEXT: U.S. Navy Diving Manual, NAVSHIPS 0994-001-9010, March 1970.

Requests for enrollment by all personnel should be forwarded via official channels on NavPers form 1550/4, with appropriate changes in the "to" line as follows:

Commanding Officer
Naval Medical School
National Naval Medical Center
Bethesda, Md. 20014.
ATTN: Correspondence Training Division.

United States Navy Medicine

CORRESPONDENCE AND CONTRIBUTIONS from the field are welcomed and will be published as space permits, subject to editing and possible abridgment. All material should be submitted to the Editor, U.S. Navy Medicine, Code 18, Bureau of Medicine and Surgery, Washington, D.C. 20390

NOTICES should be received not later than the third day of the month preceding the month of publication.

PROFESSIONAL PAPERS AND ARTICLES should be typewritten on one side of the paper, double spaced, with liberal margins. Original and one carbon copy are required. Generic names of drugs are preferred. If the author's present affiliation differs from that under which the reported work was done, both should be given. Unless otherwise indicated, it will be assumed that the article presented has not been previously printed or delivered elsewhere. Papers which have been delivered or printed elsewhere, covered by copyright, cannot be reprinted in Navy Medicine without the written permission of the author(s) and copyright holder. It is the responsibility of the author(s) to inform U.S. Navy Medicine when the material submitted has been previously used or copyrighted. Navy Medicine will be happy to request permission to reprint from the copyright holder when this is necessary.

ILLUSTRATIONS are acceptable when they substantially contribute to the understanding of the basic material. Only distinct, glossy, black and white PHOTOGRAPHS which are functional can be printed. Prints should not be mounted, stapled, clipped or otherwise deformed and can be marked lightly on the back with the figure number. Legends should be typed consecutively on a separate paper with the indicated figures; credits for the photography may also be included. Identities of patients should be masked. DRAWINGS, TABLES AND GRAPHS should be minimal in number and properly labeled. They should be neatly done in heavy black ink on white paper, one to a page.

SUGGESTIONS are invited concerning U.S. Navy Medicine, its content and form.

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